NATIONAL IMPLEMENTATION PLAN FOR MANAGEMENT OF POPS IN JAMAICA

July 2005

(Revised July 2011)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

ACS	Association of Caribbean States
ARPEL	Assistencia Reciproca Petrolera Empresarial Latinoamericana
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community and Common Market
CARIRI	Caribbean Industrial Research Institute
CASE	College of Agriculture, Science and Education
CCCL	Caribbean Cement Company Ltd.
CEO	Chief Executive Officer
CGPC	Coordinating Group of the Heads of Pesticides Control Boards in the Caribbean
CSME	Single Market and Economy
DCPA	dimethyltetrachloro-terephthalate
DDE	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
DNOC	Dinitro-o-cresol
ECLAC	Economic Commission for Latin America and the Caribbean
EHU	Environmental Health Unit
EIA	Environmental Impact Assessment
ESSJ	Economic and Social Survey of Jamaica
EU	European Union
FAO	Food and Agricultural Organizatio n
FTAA	Free Trade Area of the Americas
GCH	Green cane harvesting
GDP	Gross Domestic Product
GEP	Good Engineering Practice
GOJ	Government of Jamaica
HCB	Hexachlorobenzene
HCl	Hydrogen chloride
HEART/NTA	Human Employment and Resource Training/ National Training Agency
IAEA	International Atomic and Energy Agency
IDB	Inter-American Development Bank
IICA	Inter-American Institute for Cooperation on Agriculture
III	Inter-American Indian Institute
IIN	Inter-American Children's Institute
JANEAP	Jamaica National Environmental Action Plan
JBS	Jamaica Bureau of Standards
JIS	Jamaica Information Service
JMA	Jamaica Manufacturers Association
JPS	Jamaica Public Service Company
KSAC	Kingston and St Andrew Corporation

ACRONYMS (Continued)

LDUC	Land Development and Utilization Commission
MLE	Ministry of Land and Environment
MLGCDY&S	Ministry of Local Government, Community Development and Sport
MoH	Ministry of Health
MSDS	Material Safety Data Sheet
NAFTA	North American Free Trade Agreement
NEEC	National Environment Education Committee
NEPA	National Environment and Planning Agency
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NEST	National Environmental Societies trust
ng	Nanogram
NGOs	Non-Government Organisation
NIP	National Implementation Plan
NRCA	Natural Resources Conservation Authority
NSWMA	National Solid Waste Management Authority
OAS	Organization of American States
ODPEM	Office of Disaster Preparedness and Emergency Management
P&RAU	Pharmaceutical and Regulatory Affairs Unit
PAHO	Pan American Health Organization
PAIGH	Pan American Institute of Geography and History
PCA	Pesticides Control Authority
PCB	Polychlorinated biphenyl
PCDD/F	Polychlorinated dibenzo dioxins/furans
PCNB	pentachloronitrobenzene
PIC	Prior Informed Consent
PILCC	Paper Insulated Lead Covered Cables
PRTR	Pollutant Release and Transfer Register
PSOJ	Private Sector Organization of Jamaica
RADA	Rural Agricultural Development Agency
RCRA	Resource Conservation and Recovery Act
SIA	Sugar Industry Authority
SIDS	Small Island Developing States
SIRI	Sugar industry Research Institute
SPF	Sugar Producers Federation
STATIN	Statistical Institute
TEQ	Toxic equivalent
TPD	Town Planning Department
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environmental Program
UWI	University of the West Indies

PREFACE

This National Implementation Plan (NIP) is structured along the lines recommended in the Guidance for the preparation of the National Implementation Plan[1] prepared by the Stockholm Convention on Persistent Organic Pollutants.

The consultations, meetings and workshops held with stakeholders in developing the NIP as well as a summary of previous initiatives to address POPs are listed in Appendix 1.

Additional detailed information relating to various sections of the NIP can be found in the following reports:

Smith, I. (2004). Analysis of the Capacity of NEPA, PCA and Other Relevant Institutions to Manage and Eliminate PCBs and to Ensure Compliance with Existing and Proposed Regulations for Unintentional POPs Releases. Prepared by Environmental & Engineering Managers Ltd., June 1, 2004.

Smith, I. (2004). National Strategy for Information Exchange, Education, Communication and Raising Awareness Among Stakeholders. Prepared by Environmental & Engineering Managers Ltd., June 21, 2004

Davis, C. (2004). PCB Destruction Technologies and their Costs. Report Prepared for National Environment and Planning Agency, 10 Caledonia Road, Kingston 5, Jamaica. Prepared by Claude Davis & Associates, October 2004

Smith, I. (2004). Inventory of POPs Pesticide Stocks and Sites Contaminated With Pesticides. Prepared by Environmental & Engineering Managers Ltd.

Davis, C. and Smith, I. (2004). Final Report, National Inventories of Polychlorinated Biphenyls (PCBs) Dioxins & Furans and Hexachlorobenzene. Report Prepared for National Environment and Planning Agency 10 Caledonia Road, Kingston 5, Jamaica. Prepared by Claude Davis & Associates and Environmental & Engineering Managers Ltd., October 2004.

Davis, C. (2004). Final Report, Gap Analysis for POPs Management in Jamaica. Report Prepared for National Environment and Planning Agency, 10 Caledonia Road, Kingston 5, Jamaica, Prepared by Claude Davis & Associates, November 2004.

Davis, C. (2004). Final Report, Analysis of POPs Issues, National Objectives and Priorities. Report Prepared for National Environment and Planning Agency, 10 Caledonia Road, Kingston 5, Jamaica. Prepared by Claude Davis & Associates, November 2004.

Davis, C. (2004). Final Report, National Profile of the Existing Situation Re POPs: Recommended Management Options and Modifications to Existing Regulations and Action Plan. Report prepared for National Environment and Planning Agency, 10 Caledonia Road, Kingston 5, Jamaica, by Claude Davis & Associates, August 2004.

The NIP was prepared by Claude Davis & Associates for the National Environment and Planning Agency.

[1] UNEP/World Bank (2004). Interim guidance for developing a national implementation plan for the Stockholm Convention Revised, December 2003

EXECUTIVE SUMMARY

Outline

This report presents Jamaica's National Implementation Plan (NIP) that will form the basis for satisfying one of Jamaica's first obligations under the Stockholm Convention. The report consists of a country profile that provides the reader with general geographic, demographic, political, economic information, the current institutional and legislative framework relevant to the POPs issue and the status of POPs stockpiles and releases. This is followed by the strategy and action plan elements. The strategy is based on policy statements and previously conducted gap analyses that identified institutional, infrastructure, human and other resource needs as well as regulatory and non-regulatory measures to implement the action plans.

Country Profile

Jamaica is located in the Caribbean Sea and is approximately 145 km south of Cuba or 850 km south of Miami, Florida. Jamaica's land area is 10,990 sq. km and is approximately 230 km long oriented in an east-west axis and is about 80 km at its widest point. Jamaica has mountain ranges oriented in an east west axis and narrow coastal plains. The climate is tropical with average temperatures ranging from over 33° C at sea level to 12° C in the Blue Mountains. The mean average annual rainfall is 1895 millimetres (mm). The main climatic influences are the north east trade winds which interact with the mountain ranges along the east west axis and the warm waters of the Caribbean Sea.

Jamaica's population and economic activity are concentrated in urban and coastal areas. The mean population in 2003 was 2,633,400 and is equally split between urban and rural areas. Lower fertility and mortality rates and an increase in life expectancy have resulted in the 65 year and older group (7.7%) being the fastest growing segment of the population while the under 14 age group (31.3%) is declining. The 15-64 age group (61%) is the largest segment of the population. Life expectancy is 75.7 years.

Jamaica operates as a mixed, free market economy with state enterprises as well as private sector businesses. Major sectors of the Jamaican economy include manufacturing, agriculture, mining, tourism and financial and insurance services. Tourism, remittances and mining are the leading foreign exchange earners.

Natural resources (clear water, terrestrial and marine fauna and flora) in coastal areas are at risk from release of wastewater, solid and chemical wastes, deforestation and degradation of upland watersheds. It is estimated that only 20% of north coast coral barrier reefs are living - a tragic situation affecting communities and commercial interests dependent on fishing and tourism for their livelihood.

Jamaica's economy is heavily dependent on services, which in 2003 accounted for 67.3% of the Gross Domestic product (GDP). Goods accounted for 32.7% of GDP.

The main goods producing sector of the economy that can significantly affect POPs management is agriculture since the manufacture of sugar cane entails burning of sugar cane fields with the resulting unwanted formation of dioxins and furans. These compounds are also formed when garbage, household and hospital waste are burned and when agricultural land is cleared by burning. In the services sectors, the electricity sector and the producers of government services are the most important since they either contain entities that hold equipment containing polychlorinated biphenyls (PCBs) or are responsible for their management.

Jamaica is a constitutional monarchy and is a member of the Commonwealth. The Jamaican Parliament consists of the Senate and the House of Representatives. The Senate functions mainly as a review chamber for legislation passed by the House of Representatives. The main instrument of government policy is the Cabinet which consists of the Prime Minister and at least 13 other ministers of Government,

whose membership is restricted to one of the two Houses of Parliament. Local Government is structured on a parish basis, with two parishes, Kingston and St Andrew, amalgamated and administered by the Kingston and St Andrew Corporation (KSAC). The island's 60 constituencies are subdivided into 275 local government electoral divisions, each of which is represented by a Parish Councillor for Local Government.

This overall institutional, policy and regulatory framework within which the NIP will be implemented is aligned with ministries and their associated agencies. The agencies and government departments charged with the implementation of regulations that are relevant to POPs management include executive agencies (National Environment and Planning Agency (NEPA), the Pesticides Control Authority (PCA), the National Solid Waste Management Authority (NSWMA)) and units or departments in various Ministries of Health and Transport (the Pharmaceutical and Regulatory Affairs Unit and the Environmental Health Unit in the Ministry of Health and the Civil Aviation Authority, Port Authority, Maritime Authority, Shipping Association, Transport Authority in the Ministry of Transport).

Portfolio responsibilities that have been assigned to ministries include the development of policies and regulations. The public sector ministries and agencies interact with the public including non-government organizations and various private sector organizations and other entities and institutions.

The Natural Resources Committee of Cabinet provides a mechanism for the coordination and implementation of cross jurisdictional programs, projects and initiatives relating to land use, environmental conservation and preservation and ensuring the implementation and monitoring of international commitments, agreements and laws, particularly those which relate to land and the environment and the provision of shelter.

A strategy for sustainable development is included among the planning, policy reform, regulatory and greening of government initiatives in the government's public sector reform program in order to achieve national goals. Jamaica's sustainable development initiatives are documented in the Jamaica National Environmental Action Plan (JANEAP) reports.

The heavy reliance of the productive sectors of the economy (agriculture, mining and quarrying, tourism and manufacturing) on Jamaica's natural resources underscores the need to strategically manage the environment in order to ensure sustainability of these industries. The related social costs and benefits are significant factors and must be taken into account when making policy, regulatory, economic and investment decisions.

Jamaica is a member of various regional and international organizations and is party to a number of international conventions and treaties. The key regional organizations are the Caribbean Community and Common Market (CARICOM) and the Organization of American States (OAS). The Conventions that are most relevant to POPs management are the Stockholm, Basel and Rotterdam Conventions. Jamaica signed the Stockholm Convention in May 2001, acceded to the Rotterdam Convention in August 2002 and became a party to the Basel Convention in January 2003.

The existing legislation and regulations that are relevant to POPs management are as follows:

- Natural Resources Conservation Authority Act (1991)
    - Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, 1996
    - Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations 2001
    - Natural Resources Conservation Authority Permits and Licences Regulations (1996)
    - Draft Air Quality Regulations
    - Draft Wastewater and Sludge Regulations

- Draft Pollutant Release and Transfer Register Regulations

- Pesticides Act (1975)
  - Pesticides Regulations (1996)
  - Pesticides (Amended) Regulations (1999)

Other relevant instruments, guidelines or Codes of Practice are:

- Green Paper on a National EMS policy and strategy
- Draft environmental Code of Practice for the Sugar Industry
- National Polychlorinated Biphenyls Management Guideline (2000)

Status of POPs Chemicals in Jamaica

PCBs

PCBs are found in electrical equipment such as transformers, capacitors and some types of cables that were manufactured using dielectric fluids that contained or were contaminated with PCBs. Unless spilled, PCBs are contained in the equipment and are therefore not released into the environment.

The main features of the PCB inventory were:

- The total amount of PCBs was estimated as 70.3 kg of PCBs in 158,942 kg of PCB-contaminated oils in approximately 1,306 contaminated or potentially contaminated transformers. The estimate included information from nearly all of the largest users of power except for two sugar factories.
- There were 7,089 litres of askarel that are slated for export under the Basel Convention for destruction overseas.
- There were at least 2,656 capacitors and ballasts that potentially contain PCBs but there was no basis for estimating the amount of PCBs in these capacitors.
- There were at least 13,396 m of Paper Insulated Lead Covered (PILC) cables that potentially could contain PCBs but there was no basis on which to estimate the amount of PCBs in these PILC cables.
- The number of ballasts used in fluorescent lighting that could contain PCBs was unknown.

The aforementioned estimates must be qualified because of the following:

- Analytical data for the PCB concentration were available for only 20% of the estimated 1,306 transformers. The vast majority of the lacking concentration data were for in-service transformers.
- The total number of transformers included approximately 852 that were in-service in the JPS system. The amount of PCBs in these transformers were assumed to be similar to those that were out of service

Although there were approximately 20 facilities that were likely to own transformers for which no information on whether or not they were PCB or non-PCB transformers, the overall impact on the total inventory is expected to be small since these facilities, because of their activities, were expected to have few transformers.

POPS Pesticides

Since all of the POPs pesticides (aldrin, arochlor, chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, toxaphene) have been banned in Jamaica and there was a campaign to collect and dispose of obsolete and unwanted pesticides, the remaining amount of POPs pesticides is small. Only 30 litres of a mixture containing heptachlor and 1 litre of chlordane have been identified and they are in storage at two sites.

DDT

No stocks of DDT were found. DDT has been banned in Jamaica since 1999.

Dioxins, Furans and HCB

Dioxins and furans as well as HCB are unintentionally formed as a by-product in combustion processes and can also be found as impurities in some products. Dioxins, furans and HCB are released into the environment when burning of various materials takes place. A summary of the releases of dioxins and furans in 2003 by medium (releases to air, land water and amounts released in products and in residues) is given in Table 1. The greatest percentage (78.3%) of dioxins and furans were released in residues followed by releases to air (20.6%), water (1.2%) and land (0.83%). Releases to air were dominated by burning of garbage and sugar cane fields (57.6%) and waste incineration -primarily from hospital wastes (40.9%).

Releases to water were based entirely on leachate from landfill/dumpsites while releases to land arise exclusively from residues left after uncontrolled combustions. The amounts left in residues arise mainly from disposal/landfilling (75.7%) and much less from uncontrolled combustion (24.3%).

The emissions, although subject to considerable uncertainties, clearly indicate that the management of dioxins and furans releases will depend on addressing hospital incineration, burning of cane fields and uncontrolled burning of garbage/household waste and accidental fires. Gaps in the inventory comprise information for updated activity data and categories for which there were no activity or emission factor data.

Table 1 Summary of Dioxins and Furans Emissions, 2003

	Source Categories	Annual Releases (g TEQ/y)				
Cat.		Air	Water	Land	Products	Residue
1	Waste Incineration	114.0	0.000	0.000	0.000	0.578
2	Ferrous and Non-Ferrous Metal Production	0.000	0.000	0.000	0.000	0.0
3	Power Generation & Heating	0.074	0.000	0.000	0.000	0.0
4	Production of Mineral Products	4.22	0.000	0.000	0.000	0.040
5	Transportation	0.013	0.000	0.000	0.000	0.0
6	Uncontrolled Combustion Processes	160.7	0.000	11.10	0.000	254
7	Production of Chemicals and Consumer Goods	0.000	0.000	0.000	0.683	0.0
8	Miscellaneous	6.96×10^{-11}	0.000	0.000	0.000	0.0
9	Disposal/Landfilling	0.000	0.016	0.000	0.00037	794
10	Identification of Potential Hot-Spots					
1-9	**Total**	**279.0**	**0.016**	**11.1**	**0.683**	**1049.2**

HCB

Preliminary estimates of HCB releases in Jamaica are 0.058 kg/y to air and 0.64 kg/y to water from sewage treatment plants. The HCB emissions to air are mainly from uncontrolled combustion processes with much smaller amounts from hospital incinerators. No emission factors for HCB emissions from uncontrolled hospital incinerators were found so the emission factor for burning of household waste was assumed. The HCB emissions from hospital incinerators were very small (6.3×10^{-5} kg).

There are no specific regulations, guidelines or management initiatives for HCB but because of the similarity in sources of HCB and dioxins & furans, the same initiatives will apply. Unlike dioxins and furans there are no emission standards for HCB for incineration. In view of the low amount of HCB emissions (assuming the emission factors are appropriate) and the lack of data that would allow establishment of emission standards, no such standards should be contemplated at this time.

PCB Contaminated Sites

There were no documented PCB contaminated sites. Three sites were identified as having a high potential for PCB contamination. This was based on observations of leaking transformers and previous disposal practices for transformer oil. A sampling and monitoring program (soil and water) conducted at two of these sites found that there was no contamination. .

Summary of Future Production, Use and Releases of POPs – Requirements for Exemptions

The Convention allows exemptions for acceptable uses of certain POPs chemicals such as DDT that would allow its use for malaria vector control. While there are no immediate plans to apply for such exemption in respect of DDT, the option remains open under the convention and Jamaica may be prepared to exercise such an option if warranted. DDT was used for the vector control of the malaria disease in Jamaica and this disease has effectively been eradicated in Jamaica. Reported cases of malaria in Jamaica over the past ten years (1994 to 2003) have ranged from 3 to 14 cases each year. These cases have been attributed to persons who are returning to or visiting the island. As such the likelihood is small that there will be any need for vector control for malaria.

Existing Programmes for Monitoring of Releases and Environmental and Human Health Impacts of POPs

Currently, there are no programmes to routinely monitor the levels of POPs chemicals in the environment or to measure the releases of any of the incidentally formed POPs chemicals. Information from previous studies on the levels of POPs pesticides in the environment (water, sediments etc.) showed that Kingston Harbour and in particular Hunt's Bay are the areas that are most heavily contaminated with pesticides. Aldrin, arochlor, DDT, dieldrin, endrin and HCB were among the POPs chemicals found. There are no studies on bioaccumulation of pesticides in the food chain. These studies and other initiatives spearheaded by the Pesticides Control Authority, led to the restriction and eventual banning of POPs insecticides in Jamaica in 1999.

Current Level of Information, Awareness and Education Among Target Groups

The level of awareness of the potential dangers of PCB and the management of PCB equipment is varied. It is high at JPS, bauxite and alumina companies and some of the larger companies who have already addressed or are in the process of eliminating PCBs from their facilities. In contrast, awareness of PCBs was lacking at many of the facilities visited but the project has to some extent rectified this. There remains a great need for increasing awareness about PCBs and for training of personnel that service electrical equipment that could or does contain PCBs.

There are high levels of awareness and commitment to pesticide management issues (including POPs pesticides) in the public sector, commercial users and educational institutions but there remains a need to continue efforts at raising awareness and training of farmers in pesticide use and the ecological impacts of pesticides.

The most serious gap is in the level of awareness about unintentionally formed POPs - dioxins and furans. This is especially true of the general population whose activities (burning garbage, clearing agricultural land) lead to widespread exposure to these chemicals.

Relevant Activities of Non-Governmental Stakeholders

The participation of non-government stakeholders to date has been limited. One funding agency has specifically noted the availability of funding for POPs related projects.

Overview of Technical Infrastructure for POPs Assessment, Measurement, Analysis, Management, Research and Development – Linkage to International Programmes and Projects

The assessment of POPs issues will require physical resources for sampling and analysis and technically skilled staff to conduct various types of assessments.

There is adequate capability at a single laboratory to analyse environmental and other samples for PCBs and POPs pesticides. As part of this project, equipment upgrades were provided that enabled analytical capability for speciated PCB and pesticides analyses at low concentrations. Equipment is available to perform analyses for dioxins and furans but resources are needed to develop the analytical methodology including safety protocols.

There is currently no capability to conduct ambient air sampling for dioxins and furans, PCBs and pesticides. In the case of dioxins and furans this gap is critical in view of the widespread exposure to these compounds because of household and agricultural waste, sugar cane fields and totally inadequate "incinerators" at the majority of hospitals.

After the recommended closure of the inadequate "incinerators" the limited number of incinerators should not warrant acquisition of public sector capability for stack sampling for dioxins and furans. However, NEPA staff should receive training in order to be able to technically assess such stack monitoring and to audit (witness) tests.

There is need for sustainable POPs monitoring programs to address PCB levels in groundwater, sewage and sediments and dioxins and furans in air (especially associated with sugar cane field burning,) and also in sewage and sediments.

Disposal/Destruction Facilities

A major gap is the need for a properly constructed hazardous waste facility. The destruction of PCBs and pesticides in cement kilns is technically possible (for example by burning a blend of fuel oil with pesticides or PCBs dissolved in a suitable solvent) and further examination of this option is required.

The quantities of POPs pesticides is small (~31 litres) but the amounts of other non-POPs pesticides is unknown at this time.

Resources for Programme Implementation

Implementation of the POPs management programme will require additional human resources for monitoring, enforcement, prevention, communication, public education, assessment and reporting functions at NEPA and supporting agencies. Resources are lacking to undertake these functions.

Identification of Impacted Populations or Environments, Estimated Scale and Magnitude of Threats to Public Health and Environmental Quality

Quantitative exposure data for POPs in Jamaica are lacking. Measurements of pesticide levels showed widespread contamination of water, sediment and fauna with chlordane, dieldrin, lindane, endosulfan and dichlorodiphenyldichloroethylene (DDE). Aldrin and endrin which were used widely in the 1950s and 1960s, were never detected. Chlordane and lindane were not detected in the 1989/1990 samples and DDE and dieldrin levels decreased since 1982–1983. All of the pesticides however were detected in Kingston Harbour water and sediment (into which the Rio Cobre drains). In view of their persistence and

bioaccumulation it is highly likely that pesticides (including POPs) will be present in fauna and flora in Kingston Harbour as well as in other coastal waters and sediments.

The extent and levels of contamination are unknown. Significant amounts of the food supply (vegetables, shrimp) are produced in coastal areas and the exposure to POPs and other pesticides through the food supply are unknown.

Qualitative exposure data for dioxins and furans can be inferred from the extent to which the population is exposed to emissions from combustion sources. The burning of sugar cane occurs in 6 of the 14 parishes while the burning of garbage, fires at waste disposal sites (especially Riverton City site in St Andrew) and hospital incinerators all occur near population centres and therefore would cause exposure to large segments of the population. Such widespread exposure is cause for concern and a monitoring program is urgently needed to determine the level of exposure.

Systems for Assessment and Listing of New Chemicals

The importation and use of pesticides in Jamaica are regulated by PCA and there is an existing database as well as annual reporting on the quantities of groupings of pesticides and herbicides. New pesticides need to be registered prior to their importation and use in Jamaica. The Pharmaceutical and Regulatory Affairs Unit (PRAU) in the Ministry of Health regulates the importation of chemicals (excluding pesticides and herbicides). Importers are required to obtain a permit from PRAU.

There is no formal system to track other chemicals that are in use in commerce in Jamaica nor is there a system to regulate or track any new chemicals that are introduced. Efforts are under way to computerise the system that will track the nature and quantities of chemicals that are imported.

Strategy and Action Plan Elements

The following policy statement summarises GOJ's position on POPs management and how their management will be integrated into the management of chemicals and other hazardous materials, other related environmental policies and Jamaica's sustainable development strategy. The policy statements reflect the recognition of the risks posed by POPs chemicals and establish broad goals and objectives that would be implemented based on core principles.

The strategies and activities for implementing the management of POPs chemicals will be based on a risk assessment approach and will be guided by the precautionary principle. The polluter pays principle will be applied in decisions regarding the assessment, cleanup and remediation of contaminated sites. The release of information to the public will recognise and fully support the "Community right to know" for all information related to POPs chemicals.

The policy will be supported by:

- ensuring that there are adequate human resources to implement the policy;
- ensuring that there is effective public education and communication of POPs related issues to all stakeholders; and
- carrying out environmental sampling and monitoring and related activities in order to assess the effectiveness of the policy throughout its implementation.

Goals

The key goals of the policy are as follows:

- establish suitable sites for the safe storage of all out-of-service PCB equipment by 2006;
- eliminate all in-service PCB equipment in the transmission system by 2008 and in the distribution system by 2020;
- dispose of all in-storage PCB equipment and other PCB materials by 2020;

- identify all PCB and pesticide contaminated sites by 2006, isolate any such sites and devise means for their decontamination by 2010.
- eliminate the risks to human health posed by the burning of wastes such as hospital wastes and other materials in fireboxes and other quasi- incinerators by 2010;
- provide environmentally sound and economically sustainable means to minimize or eliminate the risks posed by burning of garbage and sugar cane fields and by the burning of land in preparation for farming by 2010;
- upgrade the management of all sites where pesticides are stored by 2006 by upgrading specifications for such sites and establishing documented routine inspections of such sites and mechanisms for reporting changes in the amounts of materials stored at such sites;
- establish means to avoid the importation of unwanted pesticides and other hazardous materials and establish means to periodically dispose of any such pesticides and other hazardous materials by 2008;

Action Plan

The following is a summary of the activities needed to implement the plan.

Institutional, Policy and Regulatory Strengthening Measures

- Revise/Update PCB Management Guideline Document
- Select a strategy for regulating PCBs (PCB Guidelines alone or include in regulations)
- Update regulations to include standards for POPs (and other) pesticides in drinking water
- Develop regulations for hazardous chemicals management including storage of pesticides and PCBs
- Finalise the medical waste policy
- Develop a plan for reducing trash burning including provision of alternatives in areas not served by garbage collection, and develop complementary public education and awareness programs.
- Update the Country Fires Act and develop guidelines for municipal/parish council by-laws regarding trash and slash burning
- Ensure integration of PCB management with Hazardous Materials and Hazardous Waste Policy
- Establish and implement a policy for complete phasing out of sugar cane burning that is, 100% green cane harvesting (GCH)
- Conduct a detailed economic analysis of the introduction of GCH
- Update Draft trade effluent & sewage regulations to include standards for PCB in drinking water, irrigation and sewage sludge

Disposal of Stockpiles of POPs Pesticides

- Establish secure storage site for POPs pesticides and other unwanted or obsolete pesticides
- Establish a database for stocks of unwanted and unknown pesticides
- Destroy stocks of POPs and unwanted or unidentified pesticides
- Complete the identification, labelling, storage and disposal of PCBs and PCB equipment
- Test all out-of-service transformers manufactured before 1980 for PCBs
- Test all in service pad mounted transformers manufactured before 1980 for PCBs

- Eliminate remaining PCBs in 2.3 kV and 6.9 kV distribution systems
- Establish secure PCB storage sites
- Eliminate PCBs in electricity transmission system

Reduce or Eliminate Unintentional Releases of Dioxins, Furans and HCB

- Develop and implement plan for GCH
- Increase GCH to 100% over 5 years
- Provide viable alternative disposal means and ban trash burning in urban areas
- Implement the medical waste policy including closure of devices in which hospital wastes are burned inappropriately and implementing alternate disposal methods for disposal of hospital and other medical waste

Plan for Assessment and Mitigation of Releases from Stockpiles and Wastes

- Conduct monitoring program at potentially contaminated sites (based on preliminary investigation)
- Identify and manage contaminated sites
- Extend monitoring at contaminated sites
- Manage contaminated sites (to be determined pending outcome of monitoring program)

Strategy for Information Exchange, Public Awareness, Training and Education

- Implement outreach program for PCB stakeholders and other interested parties
- Develop plans for outreach and public education & training
- Develop strategies for tracking changes in public behaviour
- Launch POPs public education program (focus on incidentally formed POPs and POPs pesticides)
- Review and update various curricula and introduce POPs related training courses as needed

Monitoring and Reporting

- Establish sampling and analytical capability for dioxins & furans
- Conduct research monitoring programs (PCBs, pesticides and dioxins & furans in various environmental media (air, freshwater, sediments, soil, foods)
- Put in place mechanisms for annual updates and annual reporting of POPs inventories

Estimate of Additional Resources Needed to Implement NIP

Preliminary estimates of the additional resources needed to implement the plan over the next six years (up to 2011) are about US $18 million. This estimate does not include some items for which cost estimates are not feasible at this time and it is based on the upper end of ranges where such ranges are necessary. A breakdown of the costs into seven subcategories is given below.

Table 2. Preliminary Cost Estimate to Implement the National Implementation Plan for POPs.

Cost Estimate (US $)	**Cost Estimate (US $)**	
Institutional, Policy and Regulatory Strengthening Measures	15,934,000	*
Disposal of Stockpiles of POPs Pesticides	$110,000	*
Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs	$594,000	*
Reduce or Eliminate Unintentional Releases of Dioxins, Furans, HCB and PCBs	700000	*
Plan for Assessment and Mitigation of Releases from Stockpiles and Wastes	100000	
Identification and Management of Contaminated Sites	$60,000	*
Strategy for Information Exchange, Public Awareness, Information and Training	155000	
Monitoring	250000	
Reporting	$48,000	
Total	**17,951,000**	

* Includes items for which preliminary cost estimates are not feasible until additional monitoring data for PCBs in electrical equipment or POPs in the environment are available.

1. NATIONAL PROFILE OF THE EXISTING SITUATION RE POPS AND POTENTIAL MANAGEMENT OPTIONS

1.1 INTRODUCTION

Jamaica is a signatory to the Stockholm Convention which seeks to protect human health and the environment from persistent organic pollutants (POPs). The conventions has targeted an initial set of twelve chemicals which includes intentionally produced pesticides and industrial chemicals (aldrin, chlordane, dieldrin, dichlorodiphenyltrichloroethane (DDT), endrin, heptachlor, hexachlorobenzene (HCB), mirex, polychlorinated biphenyls (PCBs), toxaphene) and unintentionally produced by-products of industrial and combustion processes (dioxins, furans and HCB). Parties to the convention are required to take actions to eliminate the production, use and related trade of the intentionally produced chemicals. The goal for unintentionally produced POPs is to reduce and if possible eliminate their releases from man made sources and to reduce their unintentional production. The Convention has reporting obligations

Parties to the Conventions have various obligations. These include the development of an action plan to identify, characterize and address the release of POPs within 2 years of entry into force of the convention. Parties must also implement the action plan, promote the application of measures to eliminate sources of POPs or to achieve realistic and meaningful reductions in their release. Other obligations include the promotion of the development and use of substitute or modified materials, products and processes to prevent the formation and release of these POPs; promote and require the use of best available techniques (BATs) for new sources within 7 specified industrial source categories with comparatively high potential for POPs formation and release and phase in such requirements within 4 years of entry into force; promote the use of BAT for new sources within 13 specified industrial source categories with potential for POPs formation and release; promote the use of BAT for existing sources within all 20 specified industrial source categories; and promote the use of best environmental practices (BEP) for all new and existing sources within all 20 specified industrial source categories.

This report presents Jamaica's National Implementation Plan that will form the basis for satisfying one of Jamaica's first obligations under the Stockholm Convention.

Country profile information is presented in Section 2. This includes general geographic, demographic, political and economic information, the current institutional and legislative framework relevant to the POPs issue and the status of POPs stockpiles and releases. Section 3 presents the strategy and action plan elements. The strategy is based on policy statements and previously conducted gap analyses that identified institutional, infrastructure, human and other resource needs as well as regulatory and non-regulatory measures to implement the action plans. The action plans are provided as compound-specific measures for PCBs, incidentally formed POPs (dioxins, furans and hexachlorobenzene) and the POPs pesticides. Generic options (i.e., not compound specific) are provided separately.

2. COUNTRY BASELINE

This section presents general information on Jamaica's geography, climate, population, political arrangement, economy and environmental profile to provide readers with basic information on the island. The institutional, policy and regulatory framework is described to indicate the overall context within which POPs management will take place. The current situation with respect to what is known about POPs is presented.

2.1 Country Profile

2.1.1 Geography and Climate

Jamaica is an island in the Caribbean Sea, centred on latitude 18º 15"N and longitude 77º 30" W. It is located approximately 145 km south of Cuba or 850 km south of Miami, Florida. The island is approximately 230 km long oriented in an east-west axis and is approximately 80 km at its widest point. Land area is 10,990 km^2 of which about 160 km^2 is water. The coastline is approximately 1,022 km.

Jamaica has narrow coastal plains and several rugged mountain ranges oriented in an east west axis. The highest point, the Blue Mountain Peak, is 2,256 m above sea level. About sixty percent of the island's bedrock is white limestone; twenty five percent is volcanic and cretaceous, ten percent alluvial and five percent yellow limestone.

The climate is tropical with average temperatures ranging from over 33° C at the Norman Manley International Airport at sea level to 12° C at Cinchona Gardens located in the Blue Mountains. The mean average annual rainfall for the period 1881-1998 was 1895 millimetres (mm). The main climatic influences are the north east trade winds which interact with the mountain ranges along the east west axis and the warm waters of the Caribbean Sea. Other climatic influences are synoptic weather systems, primarily the Azores-Bermuda high-pressure system, surface, mid and upper level troughs, frontal systems, easterly waves, tropical depressions, tropical storms, hurricanes and infrequently, the inter-tropical convergence zone. Rainfall is the dominant meteorological variable that influences the meso-scale fluctuations of temperature, humidity, sunshine and evaporation.

2.1.2 Population

The mean population in 2003 was 2,633,400 and the growth rate was estimated at 0.6%. Historical population growth rates over the past decade have ranged from 0.5 to 1.2% and have been influenced by declining a downward trend in the crude birth rate and international migration. The population in 2003 was equally split between urban and rural areas. Approximately 50% of the population resided in the highly urbanised parishes of Kingston, St Andrew, St Catherine and St James.; 25% of the population resided in Kingston & St Andrew.

In 2003, the gender split in the population was 49.3% male and 50.7% female. Lower fertility and mortality rates and an increase in life expectancy have resulted in the 65 year and older group (7.7%) being the fastest growing segment of the population while the under 14 age group (31.3%) is declining. The 15-64 age group (61%) is the largest segment of the population. Life expectancy is 75.7 years. Selected demographic data are presented in Table 2-1.

2.1.3 Economy

Jamaica operates as a mixed, free market economy with state enterprises as well as private sector businesses. Major sectors of the Jamaican economy include manufacturing, agriculture, mining, tourism and financial and insurance services. Tourism, remittances and mining are the leading foreign exchange earners.

Table 2-1 Population, Rate of Increase, Birth and Death Rates, 1991 - 2002

Year	End of Year Population	Mean Population	Annual Percentage Rate of Growth	Life Expectancy#	Crude Rate of Natural Increase	Crude Birth Rate	Crude Death Rate	Migration Net Rate
					Per 1,000 Mean Population			
1991	2,395,500	2,386,800	0.7		19.5	25.1	5.6	-11
1992	2,419,900	2,407,700	1		18.8	24.3	5.5	-8.7
1993	2,441,600	2,430,800	0.9		17.9	23.6	5.7	-9
1994	2,468,000	2,454,800	1.1		18.6	24.1	5.5	-7.8
1995	2,498,000	2,483,000	1.2	74.4	19.4	25.6	6.2	-7.3
1996	2,521,700	2,509,900	1	74.8	16.9	23.6	6.7	-7.4
1997	2,546,900	2,534,300	1		17.4	23.4	6.0	-7.5
1998	2,567,100	2,557,000	0.8		16.0	22.3	6.3	-8
1999	2,581,800	2,574,500	0.6		14.2	21.1	6.8	-8.4
2000	2,597,100	2,589,500	0.6	75.3	14.7	21.1	6.3	-8.7
2001	2,612,500	2,604,800	0.6	75.5	14.4	20.6	6.2	-8.5
2002	2,624,700	2,618,600	0.5	75.7	13.7	20.0	6.5	-8.8
2003	2,641,600	2,633,400	0.6	74.2	12.9	19.4	6.4	-6.7

Source: ESSJ, 2003

#World Bank (2003). Report No. 26088-JM. Jamaica, The Road to Sustained Growth. Country Economic Memorandum

Jamaica's population and economic activity are concentrated in urban and coastal areas. Natural resources (clear water, terrestrial and marine fauna and flora) in these areas are at risk from release of wastewater, solid and chemical wastes, deforestation and degradation of upland watersheds. It is estimated that only 20% of north coast coral barrier reefs are living -- a tragic situation affecting communities and commercial interests dependent on fishing and tourism for their livelihood.

Jamaica's economy is heavily dependent on services, which in 2003 accounted for 67.3% of the Gross Domestic product (GDP). Goods accounted for 32.7%. The percentage contributions to total goods and services production to GDP for the period 1998 to 2003 are shown in Table 2-2.

After five years of declining GDP, the economy increased by 0.9% in 1999, 0.8% in 2000, 1.5% in 2001, 1.2% in 2002 and 2.1% in 2003. Serious problems facing the economy include: high interest rates; increased foreign competition; a pressured, sometimes sliding, exchange rate; a widening merchandise trade deficit; growing internal debt and high crime rates. Jamaica's medium-term prospects will depend upon increased foreign investment, growth in tourism, maintaining a competitive exchange rate, selling off reacquired firms and implementing proper fiscal and monetary policies.

The main goods producing sector of the economy that can significantly affect POPs management is agriculture since the manufacture of sugar cane entails burning of sugar cane fields with the resulting unwanted formation of dioxins and furans. The acreage of sugar cane reaped declined from 37,600 ha in 1998 to 30,600 ha in 2003.

In the services sectors, the electricity sector and the producers of government services are the most important since they either contain entities that hold PCB equipment or are responsible for their management. Between 1998 and 2003, the electricity & water sector grew at an annual an average rate of between 3.7% and 4.0%. Electricity generation has increased consistently by between 3% and 4% annually since 1998. The increases have been driven by increases in the numbers of residential customers

as well as in the average consumption per customer in all types of rate categories except residential and large power categories. These increases could affect the timing for the replacement of aging equipment that is likely to contain PCBs.

2.1.4 Government

Jamaica is a constitutional monarchy and is a member of the Commonwealth. The Queen of England, Elizabeth II, is the titular head of the country and is represented in Jamaica by a governor-general.

The Jamaican Parliament consists of two Houses, the Senate (21 members) and the House of Representatives (60 members). The Senate functions mainly as a review chamber for legislation passed by the House of Representatives. Senators are appointed by the Governor General, 13 upon the Prime Ministers advice and 8 on the advice of the leader of the opposition.

The main instrument of government policy is the Cabinet which consists of the Prime Minister and at least 13 other ministers of Government, whose membership is restricted to one of the two Houses of Parliament. Not more than four members of the Cabinet may be members of the Senate. The Minister of Finance must be an elected member of the House of Representatives.

Local Government is structured on a parish basis, with two parishes, Kingston and St Andrew, amalgamated and administered by the Kingston and St Andrew Corporation (KSAC). The island's 60 constituencies are subdivided into 275 local government electoral divisions, each of which is represented by a Parish Councillor for Local Government.

Table 2-2 Contributions to Total Goods and Services Production, 1998- 2003 (Per Cent)

SECTOR	1998	1999	2000	2001	2002	2003
GOODS	***34.7***	***34.1***	***33.0***	***33.5***	***32.9***	***32.7***
Agriculture, Forestry & Fishing	6.8	6.8	5.9	6.2	5.7	5.9
Mining & Quarrying	5.1	5.1	5.0	5.1	5.2	5.3
Manufacturing: Food, Beverages & Tobacco	7.0	7.0	7.0	7.3	7.2	7.0
Other Manufacturing	6.7	6.4	6.3	6.0	5.8	5.6
Construction & Installation	9.0	8.8	8.8	8.9	9.0	8.9
SERVICES	***65.3***	***65.9***	***67.0***	***66.5***	***67.1***	***67.3***
Electricity & Water	3.4	3.5	3.6	3.6	3.7	3.8
Distributive Trade	21.4	21.1	21.2	21.1	20.9	20.7
Transport, Storage & Communication	10.6	11.2	11.8	12.3	12.9	13.0
Financing & Insurance Services	7.5	7.9	8.1	7.4	7.7	7.9
Real Estate & Business Services	5.0	4.9	4.8	4.8	4.8	4.8
Producers of Government Services	9.9	9.8	9.7	9.7	9.6	9.4
Miscellaneous Services: Tourism	5.3	5.4	5.7	5.5	5.4	5.6
Miscellaneous Services: Other	2.2	2.2	2.1	2.1	2.1	2.1
Total	100	100	100	100	100	100
Change	-1.2	0.9	0.8	1.5	1.1	2.3
Total GDP at Constant (1996) Prices (J$ Million)	219491.3	221486.0	223245.4	226635.0	229`95.2	234069.7

Source: ESSJ, 2003

2.2 Institutional, Policy and Regulatory Framework.

This section describes the present overall institutional, policy and regulatory framework within which the NIP will be implemented.

2.2.1 Institutional, Policy and Regulatory Framework

POPs issues are among those included in Jamaica's draft hazardous waste management policy framework. The institutional and policy framework within which POPs management falls is illustrated in Figure 2-1. The main institutions are public sector ministries and agencies that interact with the public including non-government organizations and various private sector organizations and other entities and institutions.

The Ministries and Government Agencies with responsibilities for POPs management issues are summarised in Table 2-3. The key ministries and agencies are as follows:

Ministries:

Ministry of Land & Environment
Ministry of Local Government Community Development and Sport
- Jamaica Fire Brigade

Ministry of Health
- Pharmaceutical and Regulatory Affairs Unit (PRAU)
- Environmental Health Unit (EHU)

Ministry of Agriculture
Ministry of Transport and Works
Ministry of Labour and Social Security
- Factory Inspectorate

Ministry of Commerce, Science and Technology
- The Government Electrical Inspectorate

Ministry of Finance
- Jamaica Customs

Agencies

National Solid Waste Management Authority (NSWMA)
National Environment and Planning Agency (NEPA)
Pesticides Control Authority (PCA)
Jamaica Bureau of Standards (JBS)

Portfolio responsibilities in government rest with ministries and these responsibilities include the development of policies and regulations. The mandate of the Natural Resources Committee of Cabinet includes the provision of a mechanism for the coordination and implementation of cross jurisdictional programs, projects and initiatives relating to land use, environmental conservation and preservation and ensuring the implementation and monitoring of international commitments, agreements and laws, particularly those which relate to land and the environment and the provision of shelter.

Various agencies and government departments are charged with the implementation of regulations that are relevant to POPs management. These include executive agencies (NEPA, PCA, NSWMA) and units or departments in various Ministries of Health and Transport (PRAU, EHU in the Ministry of Health and the Civil Aviation Authority, Port Authority, Maritime Authority, Shipping Association, Transport Authority in the Ministry of Transport). The specific roles and responsibilities of Ministries, Agencies and other governmental Institutions involved in POPs management will be addressed in a discussion and review of the existing regulation and any gaps in the regulations and policies.

Figure 2-1 Institutional Framework for POPs and Hazardous Waste Management in Jamaica

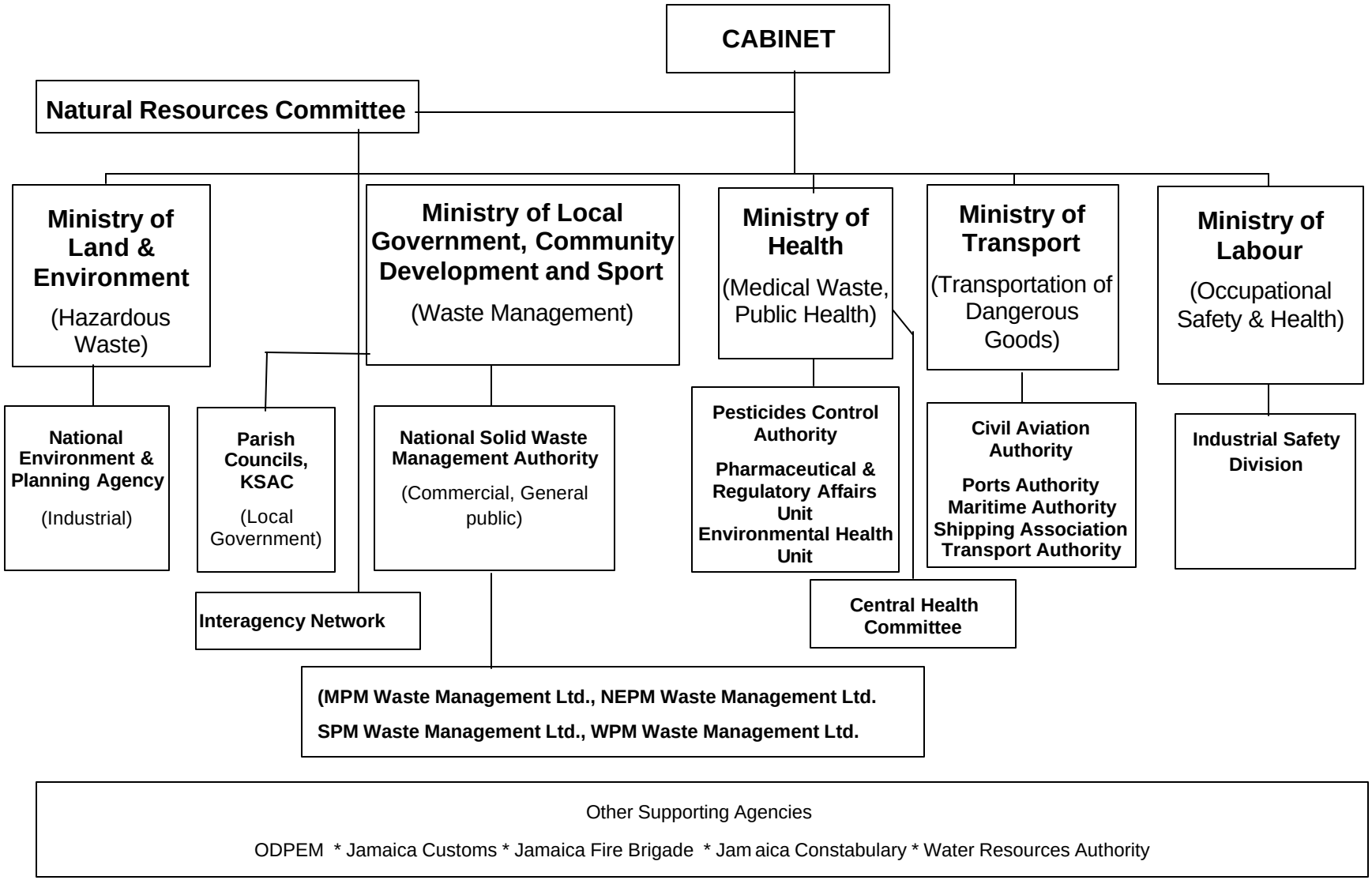

Table 2-3 Agencies and Responsibilities for POPs Management

Ministries and Associated Agencies	***Published Subject Areas Relevant to Hazardous Waste*** **Role/Responsibility re Hazardous Wastes**	**Sector**	**Acts or Regulation Administered or responsible for International Convention or Protocol relevant to POPs**
Ministry of Land & Environment			
National Environment and Planning Agency (NEPA) Natural Resources Conservation Authority (NRCA)	*Air quality and control; marine conservation and protection; disaster preparedness and emergency management; watershed management; Wildlife protection* NEPA has lead role in management of hazardous waste from industrial sector through implementation of NRCA Act and regulations (second column over);	All industrial sectors	***NRCA Act (1991);*** *Natural Resources (Hazardous Waste) (Control of Tran boundary Movement) Regulations 2002;* *The Natural Resources (Permit and Licences) Regulations 1996* *Draft Air Quality Regulations* *Draft Sewage Effluent Regulations* *Draft Trade Effluent and Industrial; Sludge Regulations* *Draft Pollutant Release and Transfer Register Regulations*
Office of Disaster Preparedness and Emergency Management (ODPEM)	ODPEM prepares and maintains mitigation plans, responds to hazardous waste disasters, ensures hazard and loss reduction are included in policies and programmes; public education	National	
Environmental Foundation of Jamaica	Funding for national hazardous waste inventory	National	
National Meteorological Services	Weather forecasting and measurement data to support planning and response to disasters involving hazardous waste	National	

Ministries and Associated Agencies	***Published Subject Areas Relevant to Hazardous Waste*** **Role/Responsibility re Hazardous Wastes**	**Sector**	**Acts or Regulation Administered or responsible for International Convention or Protocol relevant to POPs**
Ministry of Local Government Community Development and Sport National Solid Waste Management Authority Jamaica Fire Brigade Kingston and St. Andrew Corporation. Municipal Services Commission. National Solid Waste Management Authority. Parish Councils. Parish Council Services Commission. Parks and Markets.	*Solid Waste Management (Garbage Collection & Disposal and Management of Sanitary Landfills)*; *Public Cleansing*. *Fire Services;*	National Household, industrial, public sector	***The National Solid Waste Management Act (2001)*** *Jamaica Fire Brigade Act, 1988*
Ministry of National Security Jamaica Constabulary Force	*Police;* *Security of Airport and Seaports*.	National Transportation	***The Precursor Chemicals Act (1999)***
Ministry of Justice Attorney General	*Enquiries into the causes of fire and accidents*	National	
Ministry of Labour & Social Security	*Industrial safety, health and welfare*	Industrial	
Ministry of Foreign Affairs and Foreign Trade	*Maritime and aviation affairs*	National/International	
Ministry of Industry & Tourism	AgroBusiness; factory construction; *manufacturing*	Industrial, tourism	
Ministry of Agriculture		Agriculture	***Country Fires Act, 1942***

Ministries and Associated Agencies	***Published Subject Areas Relevant to Hazardous Waste*** **Role/Responsibility re Hazardous Wastes**	**Sector**	**Acts or Regulation Administered or responsible for International Convention or Protocol relevant to POPs**
Ministry of Transport and Works Caribbean Maritime Institute Jamaica Maritime Authority Air Transport Licensing Board. Airports Authority. Civil Aviation Authority. Island Traffic Authority. Jamaica Maritime Institute. Jamaica Railway Corporation. Jamaica Urban Transport Company. Metropolitan Management Transport Holdings Ltd. Port Authority. National Works Agency. Trans Jamaica Airlines. Transport Authority. Urban and Rural Transport Boards Government Electrical Inspectorate	*Air Transport; Airports; Civil Aviation; Licensing Authority; Public Passenger Transport; Public Passenger Transport (Rural Area); Road Traffic; Sea Ports*. Regulating the transportation of dangerous goods (includes hazardous waste) by all means; responsibilities for international conventions	Transportation	***Public Passenger Transport (Corporate Area) Act;*** ***Public Passenger Transport (Rural Area) Act;*** ***Road Traffic Act;*** ***Shipping Act (1998)*** *MARPOL 73/78* *London Dumping Convention* *Electrical Lighting Act, 1890* *Electrical Lighting (Buildings) Regulations, 1984*

Ministries and Associated Agencies	***Published Subject Areas Relevant to Hazardous Waste*** **Role/Responsibility re Hazardous Wastes**	**Sector**	**Acts or Regulation Administered or responsible for International Convention or Protocol relevant to POPs**
Ministry of Health	Adoption of Children; Child Care and Protection; *Drug Abuse*; Experiment on Animals; Family Planning; Food and Drug Control; *Health Facilities (Hospital and Health Centres)*; Juveniles Advisory Council; Medical Services; Mental Health Services; National Registration System; Professions Supplementary to Medicine Act; *Public Health*; Registration of Births and Deaths; Specialist Committee on Child Abuse; University Hospital.	Public and private medical Sector	***The Public Health Act (1975)*** *Public Health (Garbage Collection and Disposal) Regulations, 1998 (repealed)* *Public Health (Nuisance) Regulations 1995* ***Food and Drug Act (1964)*** *The Food and Drug Regulations (1975)*
Government Chemist Pharmaceuticals and Regulatory Affairs Unit		**National**	***The Pharmacy Act*** *Pharmacy Regulations (1975)* *Stockholm (POPs) Convention (2004)*
Pesticides Control Authority	*Pesticides Control*	**National**	***Pesticides Act (1975),*** *the Pesticides Regulations (1996) and the Pesticides (Amended) Regulations (1999)*
Environmental Health Unit			

2.2.2 Sustainable Development

A strategy for sustainable development is included among the planning, policy reform, regulatory and greening of government strategies in the government's public sector reform program[2] in order to achieve national goals. Jamaica's sustainable development initiatives are documented in the Jamaica National Environmental Action Plan (JANEAP) reports[3],[4],[5]. The JANEAP reports describe the progress made in implementing specific actions to address environmental protection issues and include reporting progress towards implementing Jamaica's commitments under Agenda 21 as well as the Small Island Developing States (SIDS) Programme of Action.

The heavy reliance of the productive sectors of the economy (agriculture, mining and quarrying, tourism and manufacturing) on Jamaica's natural resources underscores the need to strategically manage the environment in order to ensure sustainability of these industries. The related social costs and benefits are significant factors and must be taken into account when making policy, regulatory, economic and investment decisions.

2.2.3 Relevant International Commitments and Obligations

2.2.3.1 Membership in Regional Institutions

The main regional institutions to which Jamaica is a member are the Caribbean Community (CARICOM), the Association of Caribbean States (ACS) and the Organization of American States (OAS).

Caribbean Community CARICOM

Jamaica is a member of the Caribbean Community and Common Market (also termed CARICOM) which was established by the Treaty of Chaguaramas signed on 4 July 1973. By Treaty revision, effective February 2002, the successor entity is now the Caribbean Community, including the CARICOM Single Market and Economy (CSME). There are currently 15 members of the community whose membership is limited to states in the Caribbean region. Regional institutions established under CARICOM include the Caribbean Agricultural Research and Development Institute (CARDI) which was established in 1975 to serve the agricultural research and development needs of the member states.

Organization of American States (OAS)

The OAS was established in 1948 when 21 countries signed the OAS Charter. Its main objective is to strengthen cooperation and advance common interests. Membership is drawn from countries in the western hemisphere and all 35 independent countries of the Americas have ratified the OAS Charter and belong to the Organization. Cuba remains a member, but its government has been excluded from participation in the OAS since 1962. It is the region's premier forum for multilateral dialogue and concerted action.

Under the OAS umbrella are several specialized agencies including the Pan American Health Organization (PAHO); the Inter-American Children's Institute (IIN), the Inter-American Institute for Cooperation on Agriculture (IICA), the Pan American Institute of Geography and History (PAIGH) and the Inter-American Indian Institute (III).

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[2] Cabinet Office (2003). Government at Your Service: Public Sector Modernisation Vision and Strategy 2002 – 2012, Ministry Paper no. 56, tabled in Parliament on September 10, 2002.

[3] NRCA-PIOJ (1995). Jamaica National Environmental Action Plan 1995, Natural Resources Conservation Authority and Planning Institute of Jamaica

[4] NRCA (1999). The Jamaica Environment Action Plan, 1999-2002. Ministry of Environment and Housing.

[5] JANEAP Status Reports – 1996, 1997, 1998 and 2002.

The OAS addresses a number of key issues (see text Box) which include free trade. In 1994 the region's leaders met for the First Summit of the Americas, where they established broad political, economic and social development goals. A central goal for OAS has been the creation of a hemisphere-wide trading zone, the Free Trade Area of the Americas (FTAA). Since the Summit process began, a central goal has been the creation of a hemisphere-wide trading zone, the Free Trade Area of the Americas (FTAA). Working in partnership with the Inter-American Development Bank (IDB) and the United Nations Commission for Latin America and the Caribbean (ECLAC), the OAS Trade Unit has provided extensive technical support to the FTAA negotiations. It has placed particular emphasis on ensuring that the concerns of smaller economies are taken into account in the negotiating process. The promotion of pollutant release and transfer registers (PRTR) as the main vehicle for Community-right-to-know is a component of the environmental aspects which are expected to be part of the FTAA (similar to the Environmental side agreement in the North American Free Trade Agreement (NAFTA)).

Key OAS Issues

Strengthening the Democratic Commitment
Protecting Human Rights
The OAS and the Summit Process
A Voice for Civil Society
Combating Corruption
Free Trade in the Hemisphere
Hemispheric Security in the 21st Century
United against Terrorism
Evaluating Progress against Illegal Drugs
Promoting Gender Equity and Equality
Promoting Sustainable Development
Observing Elections
Fostering a Democratic Culture
Promoting National Dialogue
Mine Action: Removing Landmines
A New Approach to Development

Association of Caribbean States

The Association of Caribbean States is an organisation for consultation, cooperation and concerted action. Its current focus is on Trade, Transport, Sustainable Tourism and Natural Disasters. The Convention establishing the ACS was signed on 24 July 1994 in Cartagena de Indias, Colombia. There are currently 25 Member States and 3 Associate Members. Eight other non-independent Caribbean countries are eligible for associate membership.

The main organs of the Association are the Ministerial Council and the Secretariat. There are special committees on: Trade Development and External Economic Relations; Sustainable Tourism; Transport; Natural Disasters; and Budget and Administration. There is also a Council of National Representatives of the Special Fund responsible for overseeing resource mobilization efforts and project development.

Coordinating Group of the Heads of Pesticides Control Boards in the Caribbean (CGPC)

The CGPC was convened in 1995 to harmonise the regulation of pesticides and develop standard procedures for registration, monitoring systems for pesticide residue and to lobby for enactment of the required legislation across the region. A web site[6] has been developed to provide regional information on pesticides but currently only information for Jamaica is available. As part of the POPs implementation, the enhancement of the relationships among CGPC members should be explored.

[6] Web site URL: http://www.caribpesticides.net/

2.2.3.2 Relevant International Commitments and Obligations

In addition to being a signatory to the POPs or Stockholm Convention, Jamaica is a party or signatory to a number of international conventions that are relevant to the management of POPs and other hazardous substances.

The **Stockholm Convention** is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). Jamaica signed the convention on May 23, 2001. Implementation of the Convention requires parties to take measures to eliminate or reduce the release of POPs into the environment. There are currently 12 POPs chemicals consisting of pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, lindane, and mirex), PCBs, dioxins (PCDDs) and furans (PCDFs). Jamaica has banned the importation and use of the POPs pesticides.

The **Basel Convention** is intended to prevent or control the trade in hazardous wastes and authorizes the disposal of hazardous wastes only in participating countries, which have given prior, informed consent. Jamaica became a party to the convention through accession on January 23, 2003.

The objectives of the convention are to:

- reduce transboundary movements of hazardous wastes and other wastes subject to the Basel Convention to a minimum consistent with their environmentally sound management;
- dispose of the hazardous wastes and other wastes generated, as close as possible to their source of generation;
- minimize generation of hazardous wastes in terms of quantity and hazardousness;
- ensure strict control over movements of hazardous wastes across borders;
- prohibit shipments of hazardous wastes to countries lacking the legal, administrative and technical capacity to manage and dispose of them in an environmentally sound manner;
- assist developing countries and countries with economies in transition in the environmentally sound management of the hazardous and other wastes that they generate; and
- actively promote the transfer and use of cleaner technologies.

The parties agreed to establish regional and sub-regional centres for training and technology transfer. These centres would focus on the implementation of the Basel Convention, on the management of hazardous waste and on the minimization of its generation.

A Basel sub-regional centre for Latin America and the Caribbean has been established under the Caribbean Industrial Research Institute (CARIRI) in Trinidad.

Parties to the Basel Convention are obliged to report each year. The Ministry of Land and Environment (MLE) is the designated focal point for the Basel Convention and therefore is responsible for receiving information and submitting annual reports to the Secretariat of the Basel Convention. The reporting includes information on the following:

- wastes controlled for the purpose of transboundary movements;
- restriction on transboundary movements of hazardous wastes and other wastes;
- control procedures;
- reduction and/or elimination of the generation of hazardous wastes and other wastes
- reduction of the amount of hazardous wastes and other wastes subject to the transboundary movements;
- effect on human health and the environment;

- bilateral, multilateral agreements or arrangements;
- disposal and recovery facilities; and
- the amount of hazardous wastes and other wastes exported and imported.

There are several interrelationships between the Basel and the Stockholm Conventions, namely:

- all of the POPs currently listed in the Stockholm Convention are also classified as hazardous wastes under the Basel Convention;
- both conventions require POPs wastes to be managed in accordance with environmentally sound management practices, but the Stockholm Convention does not allow POPs wastes to be recovered, recycled or reused;
- there are several technical guidelines prepared by the Technical Working Groups of the Basel Convention that concern, or are related to, POPs as wastes;
- the Stockholm Convention encourages close cooperation with the appropriate bodies of the Basel Convention.

Under the **MARPOL 73/78 Convention** which several Caribbean countries are signatory to, member states are obligated to provide adequate reception facilities for oily (Annex 1) wastes. These reception facilities refer to a combination of collection, transport, treatment and final disposal systems in order to comply with the provisions of the convention. The conventions and maritime related protocols address issues related to oil spills/oil pollution at sea and land based sources of marine pollution.

Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

The Rotterdam Convention establishes a first line of defence by giving importing countries the tools and information they need to identify potential hazards and exclude chemicals they cannot manage safely. The Convention promotes the safe use of imported chemicals through labelling standards, technical assistance and other forms of support. It also ensures that exporters comply with the requirements. The Rotterdam Convention entered into force on 24 February 2004. Jamaica acceded to the convention on August 20, 2002.

The objectives of the Rotterdam Convention are:

- to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm; and
- to contribute to the environmentally sound use of those hazardous chemicals, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions to Parties.

The Convention creates legally binding obligations for the implementation of the Prior Informed Consent (PIC) procedure and has provisions for the exchange of information among Parties about potentially hazardous chemicals that may be exported and imported.

The Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons by Parties and which have been notified by Parties for inclusion in the PIC procedure. The Convention initially covers 22 pesticides (including five severely hazardous pesticide formulations) and 5 industrial chemicals, but many more are expected to be added in the future.

The Convention establishes a Conference of the Parties to oversee implementation, a Chemicals Review Committee to review notifications and nominations from Parties and make recommendations on which chemicals should be included in the PIC procedure and a Secretariat, whose functions are to be performed

jointly by the United Nations Environmental Program (UNEP) and the Food and Agricultural Organization (FAO).

United Nations Convention on the Law of the Sea (UNCLOS) is a self-contained international order for the marine environment. It establishes a comprehensive legal framework and allocates rights and responsibilities to member States over ocean space. The Convention covers marine pollution from: ships, both land based and sea bed operations, dumping and atmospheric pollution. It provides a framework for specific agreements on criteria and standards for all sources of marine pollution.

ARPEL - (Assistencia Reciproca Petrolera Empresarial Latinoamericana) is an oil and gas forum with membership of oil companies in the Latin American and Caribbean region. It fosters economic, commercial and technical relations with the purpose of creating favourable business opportunities. The Petroleum Corporation of Jamaica (PCJ) became a member in 1985. ARPEL has been instrumental in developing oil spill emergency response capability in the region.

International Forum for Chemical Safety (IFCS) is a "… broad consensus-building mechanism that serves as a facilitator and advocate aiming to bring order to global actions taken in the interest of global chemical safety. It functions as an accountability mechanism for its participants. The IFCS provides countries the opportunity to place issues on the international agenda and emphasize special needs and concerns with respect to improving chemicals management. All participants, including developing countries and NGOs, find it a useful mechanism to bring emerging and contentious issues to the international agenda."

All member states of the United Nations and its affiliated organizations and the International Atomic and Energy Agency (IAEA) can participate in IFCS. Jamaica's focal point is at the Ministry of Health, Pharmaceutical and Regulatory Affairs Unit (PRAU). The PRAU's functions include regulating the importation of chemicals (excluding pesticides) that could be precursors to hazardous wastes. Information on the importation of such chemicals is critical in compiling a hazardous waste inventory.

2.2.4 Principles of Existing Legislation and Regulations Addressing POPs

The existing legislation and regulations that are relevant to POPs management are as follows:

Natural Resources Conservation Authority Act (1991)

Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, 1996

Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations 2001

Natural Resources Conservation Authority Permits and Licences Regulations (1996)

Draft air quality regulations

Draft Trade Effluent and Industrial Sludge Regulations

Draft Sewage and Sewage Sludge regulations

Draft Pollutant Release and Transfer Register Regulations

Pesticides Act (1975)

Pesticides Regulations (1996)

Pesticides (Amended) Regulations (1999)

Other relevant instruments, guidelines or Codes of Practice are:

- Draft National EMS policy

- Draft Code of Practice for the Sugar Industry
- National Polychlorinated Biphenyls Management Guideline (2000)

The Natural Resources Conservation Authority Act (1991) is the principal legislation for environmental management in Jamaica. The Act established the Natural Resources Conservation Authority (NRCA) as the lead government agency with overall responsibility for the management of Jamaica's natural resources. In April 2001, the NRCA was merged with Town Planning Department (TPD) and the Land Development and Utilization Commission (LDUC) to form the National Environment and Planning Agency (NEPA). The Act requires a permit for the undertaking of prescribed kinds of development in prescribed areas of the island and empowers the Minister to promulgate regulations that may incorporate standards, codes of practice for rehabilitation or conservation of the environment. The regulations under the Act that are relevant to POPs are described below.

The Hazardous Waste Control of Transboundary Movement regulations prohibit the importation of hazardous wastes (including all POPs waste) and control the export of hazardous waste. The regulations also fulfil Jamaica's requirements as a signatory to the Basel Convention.

The Permits and Licences regulations set out the requirements for making applications to establish new facilities that fall within the prescribed categories of enterprise, construction or development set out in the Prohibition of Categories of Enterprise, Construction and Development Order, 1996. Hazardous waste storage, treatment or disposal facilities are among the prescribed categories specified in the Natural Resources Conservation (Permit and Licence) Regulations 1996. The application process includes the determination of whether or not a full environmental impact assessment (EIA) is required.

The draft air quality regulations and the draft wastewater and sludge regulations will require existing facilities that discharge wastes (trade effluent, sewage or air pollutants) above thresholds specified in the regulations to obtain a licence. The facilities that were licensed under the Permits and Licences regulations would eventually be licensed under these regulations. The draft regulations are based on industry self monitoring and reporting with NEPA undertaking an auditing role for facilities' discharges and monitoring the impacts of discharges. These regulations establish mechanisms for granting of 5-year renewable licences and for the collection of administrative fees for licence applications and renewals and discharge fees payable annually based on the polluter pays principle.

The draft PRTR regulations provide the means to achieve the Community-right-to-know principle. The PRTR regulations rely on information from the annual reports that are filed under the wastewater and sludge and air pollution regulations. NEPA would compile the information on releases and transfers that is provided by licensed facilities and add information on releases from sources that are too small to be licensed – such as mobile sources.

The Pesticides Act and the Pesticides Regulations regulate the manufacture, use, sale and importation of pesticides in Jamaica. The Act establishes the Pesticides Control Authority as the body to implement the provisions of the Act. The Pesticides Regulations include provisions that have banned the importation into Jamaica of all of the POPs pesticides namely, aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex and toxaphene. The regulations are currently being amended to include penalties and fines to make them more effective.

A national policy and strategy for environmental management systems (EMS) has been developed and is the subject of a White Paper. The strategy includes the building of capacity in the private sector to plan, implement, monitor and evaluate EMS and to strengthen the legal and economic framework to facilitate the promotion and implementation of EMS.

The regulatory and policy instruments that explicitly address aspects of PCB management are the National PCB Management Guideline, 2000 and the Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations, 2002.

The Guideline is directed at generators or holders of PCBs in the preparation of their individual management plans. It describes general principles for the handling, storage and disposal of PCBs as well as the existing legal framework in which the Guideline was developed. It does not specify details such as equipment to be acquired or disposal options to be selected. The document with some enhancements can serve as a basis for PCB management.

Various codes of practice have been developed by industry groups working in collaboration with NEPA. The role and relationship of these codes of practice to existing and proposed regulations are to be determined. There have been preliminary discussions between NEPA and the Sugar Industry regarding the practice of burning cane. A Code of Practice for the Sugar Industry is in its final stages of development and it includes suggested mitigating measures to reduce the adverse impact of emissions from cane burning on communities. The measures include identifying the sensitive areas affected by cane burning and a basis for deciding when burning would minimise the smut nuisance to nearby residential areas and smoke drift that might cause traffic hazards.

2.2.5 Key Approaches and Procedures for POPs Management Including Enforcement and Monitoring Requirements.

The key approaches for POPs management that currently exist are as follows:

- Banning the importation of POPs pesticides under the Pesticide Regulations
- Banning the importation of hazardous wastes (including POPs) and controlling the export of hazardous wastes

The ban on importation of POPs pesticides has been in effect since 1999 and, since no stocks of these pesticides imported after that date have been found, the regulations are considered effective. The dechlorination of some low level PCB contaminated equipment took place with permits issued under the Permits and Licenses Regulations. Previous exports of PCB waste took place before the promulgation of the Transboundary Movement of Hazardous Waste Regulations. Some PCB wastes are currently being prepared for export and are being handled under these regulations.

The single electrical utility company in Jamaica, the Jamaica Public Service Company Limited (JPS) has been carrying out a voluntary PCB management program designed to eliminate PCBs in their electrical equipment. Other private sector companies, notably bauxite and alumina companies also have voluntarily undertaken similar programs which are in various stages of completion. A National Polychlorinated Biphenyls Management Guideline (2000) was prepared and guided some of the earlier efforts for PCB disposal. There are several companies and institutions with PCB equipment and there is no clear regulatory approach for their management.

Other than measurements of PCBs in electrical equipment being taken out of service by JPS and a limited program undertaken during this project, there is no other active monitoring program for measuring PCBs in electrical equipment or in the environment. Also, there are no routine monitoring programs for measurement of ambient levels of PCBs or other POPs chemicals in Jamaica.

Waste disposal facilities are among the sectors that are regulated under the draft air quality regulations. The regulations include emission standards and ambient guideline concentrations for a number of pollutants including dioxins and furans. There are no specific measures for reducing or eliminating the formation of dioxins and furans formed during the burning of sugar cane fields, trash or other wastes. However, efforts are made to minimise the impacts of soot and particulate matter from burning of sugar cane fields. Although there is legislation (The Country Fires Act (1942)) that has provisions to limit the burning of trash, the legislation does not extend to the KSAC and it appears that this act is rarely (if at all) enforced.

2.3 STATUS OF POPS ISSUE IN JAMAICA

This section provides information on the current state of knowledge about POPs in Jamaica.

2.3.1 Assessment for Annex A Part I Chemicals (POPs Pesticides)

Since the POPs pesticides have been banned in Jamaica and a there was a campaign to collect and dispose of obsolete and unwanted pesticides, the known remaining amounts of POPs pesticides are small. The inventory of POPs pesticides identified only 30 litres of a mixture containing heptachlor and 1 litre of chlordane that are in storage at two sites.

The inventory also identified 3,239 L of liquid and 2,392 kg of powder/granular pesticides that are unidentified, obsolete or unwanted at a total of eight sites. There are at least 8 sites at which additional amounts of banned, unwanted or obsolete pesticides are located but the quantities are not known.

The pesticides at some but not all these sites are stored safely under good conditions. Guidelines or regulations that specify adequate storage conditions and an accurate inventory of the quantities of obsolete or unwanted pesticides are lacking. There were at least 8 sites at which there were inadequate conditions under which pesticide materials were stored but none of the pesticides were POPs pesticides.

2.3.2 Assessment for Annex A, Part II Chemicals (PCBs)

PCB Inventory

The PCB inventory applies to the amounts of PCBs and items of PCB equipment that are in storage or in service as of the end of 2003.

The main features of the PCB inventory were:

- The total amount of PCBs was estimated as 70.3 kg in 158,942 kg of PCB-contaminated oils in approximately 1,306 contaminated or potentially contaminated transformers. The estimate included information from nearly all of the largest users of power except for two sugar factories.
- There were 7,089 litres of askarel that awaited export under the Basel Convention for destruction overseas.
- There were at least 2,656 capacitors and ballasts that potentially contain PCBs but there was no basis for estimating the amount of PCB in these capacitors.
- There were at least 13,396 m of PILC cables that potentially could contain PCBs but there was no basis on which to estimate the amount of PCBs in these PILC cables.
- The number of ballasts used in fluorescent lighting that could contain PCB was unknown.

The estimates must be qualified because of the following:

- Analytical data for the PCB concentration were available for only 10% of the estimated 1,306 transformers. The vast majority of those lacking concentration data were the in-service transformers.
- The total number of transformers included approximately 852 that were in-service in the JPS system. The amount of PCBs in these transformers were assumed to be similar to those that were out of service
- Although there were approximately 21 facilities that were likely to own transformers for which no information on whether or not they have PCB transformers was available, the overall impact on the inventory is expected to be small since these facilities, because of their activities, were expected to have few transformers.

2.3.3 Assessment for Annex B Chemicals (DDT)

No stocks of DDT were found. DDT has been banned in Jamaica since 1999.

2.3.4 Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB and PCBs)

2.3.4.1 Profile for Dioxins & Furans

A summary of the emissions of dioxins and furans in 2003 by medium (releases to air, land, water and amounts released in products and in residues) is given in Table 2-4 (see also Figure 2-2). The greatest percentage (78.3%) of dioxins and furans were released in residues followed by releases to air (20.6%), water (1.2%) and land (0.83%).

Releases to air were dominated by uncontrolled combustion (burning of garbage and sugar cane fields) 57.6% and waste incineration (primarily from hospital wastes) 40.9%. Figure 2-3 illustrates the percentage contributions of releases to air.

Releases to water were based entirely on leachate from landfill/dumpsites while releases to land arise exclusively from residues left after uncontrolled combustions.

The amounts left in residues (see Figure 2-4) arise mainly from disposal/landfilling (75.7%) and much less from uncontrolled combustion (24.3%).

The emissions, although subject to considerable uncertainties, clearly indicate that the management of dioxins and furans releases will depend on addressing hospital incineration, burning of cane fields and uncontrolled burning of garbage/household waste and accidental fires.

Gaps in the inventory comprise information for updated activity data and categories for which there were no activity or emission factor data.

2.3.4.2 Profile for Hexachlorobenzene

Hexachlorobenzene (HCB) can be formed unintentionally (like dioxins and furans) but it has been manufactured commercially and used as a pesticide. There is no history of HCB use as a pesticide in Jamaica and hence releases of HCB would be due to its unintentional formation in combustion processes and in sewage treatment plants.

Preliminary estimates of HCB releases in Jamaica were 0.058 kg/y to air and 0.64 kg/y to water from sewage treatment plants. The HCB emissions to air were mainly from uncontrolled combustion processes with much smaller amounts from hospital incinerators. No emission factors for HCB emissions from uncontrolled hospital incinerators were found so the emission factor for burning of household waste was assumed. The HCB emissions from hospital incinerators were very small (6.3×10^{-5} kg). There are no specific regulatory or management initiatives for HCB but because of the similarity in sources of HCB and dioxins & furans, the same initiatives will apply. Unlike dioxins and furans there are no emission standards for HCB for incineration. In view of the low amount of HCB emissions (assuming the emission factors are appropriate) and the lack of data that would allow establishment of emission standards, no such standards need to be contemplated at this time.

2.3.5 State of Knowledge on Contaminated Sites and Wastes

PCB Contaminated Sites

There were no documented PCB contaminated sites. Reports of previous site investigations and incidents of PCB spills indicated that there was no soil or materials with a PCB concentration of greater than 50 ppm at the sites investigated.

Table 2-4 Summary of Dioxins and Furans Emissions, 2003

Cat.	Source Categories	Annual Releases (g TEQ/y)				
		Air	Water	Land	Products	Residue
1	Waste Incineration	114.0	0.000	0.000	0.000	0.578
2	Ferrous and Non-Ferrous Metal Production	0.000	0.000	0.000	0.000	0.0
3	Power Generation & Heating	0.074	0.000	0.000	0.000	0.0
4	Production of Mineral Products	4.22	0.000	0.000	0.000	0.040
5	Transportation	0.013	0.000	0.000	0.000	0.0
6	Uncontrolled Combustion Processes	160.7	0.000	11.10	0.000	254
7	Production of Chemicals and Consumer Goods	0.000	0.000	0.000	0.683	0.0
8	Miscellaneous	6.96×10^{-11}	0.000	0.000	0.000	0.0
9	Disposal/Landfilling	0.000	0.016	0.000	0.00037	794
10	Identification of Potential Hot-Spots					
1-9	**Total**	**279.0**	**0.016**	**11.1**	**0.683**	**1049.2**

Figure 2-2 **Releases of Dioxins and Furans by Media**

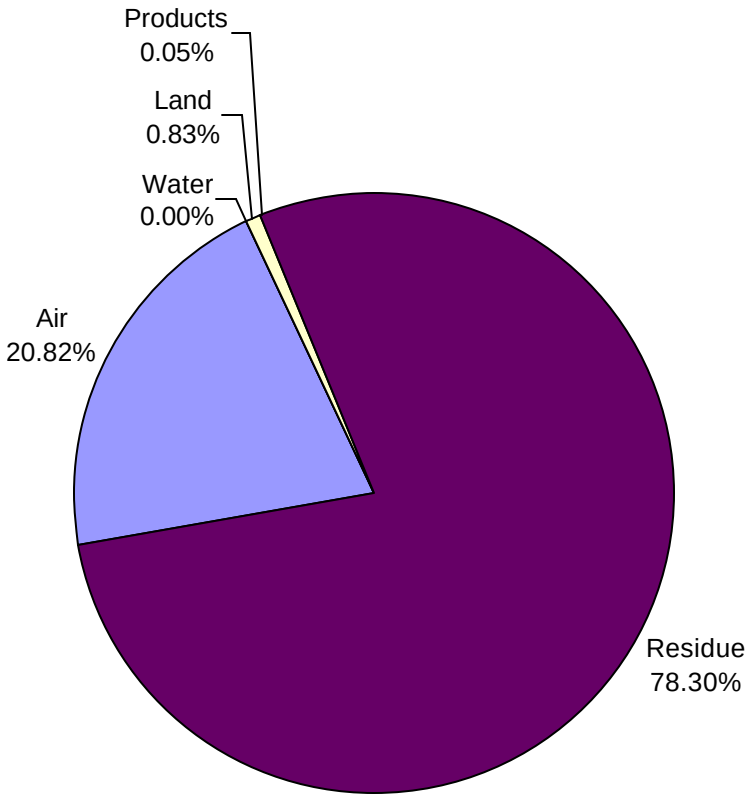


Figure 2-3 Distribution of Releases of Dioxins and Furans to Air

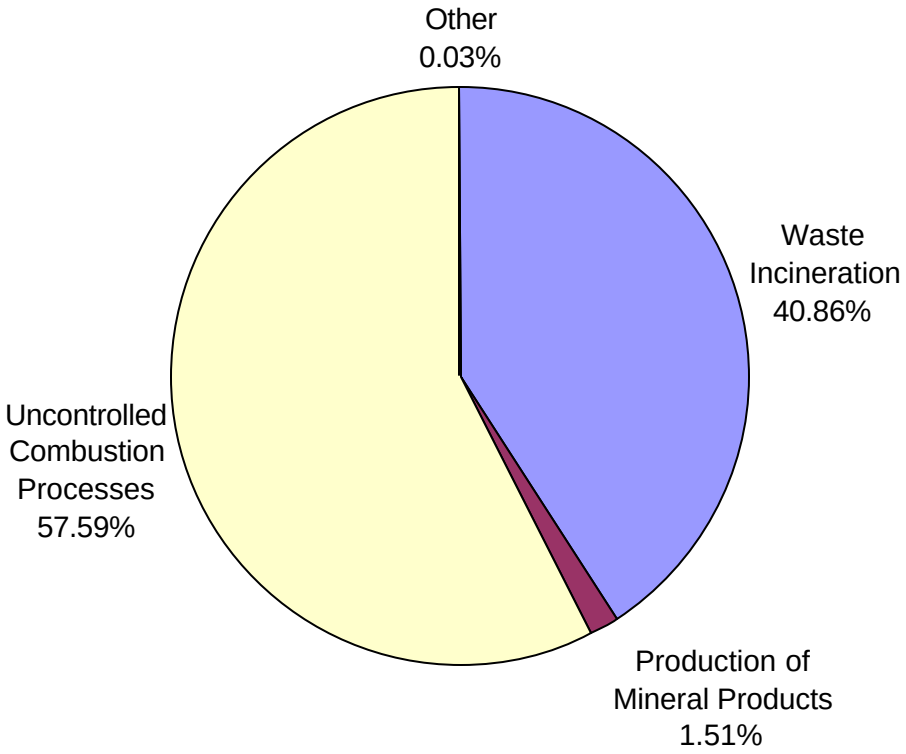
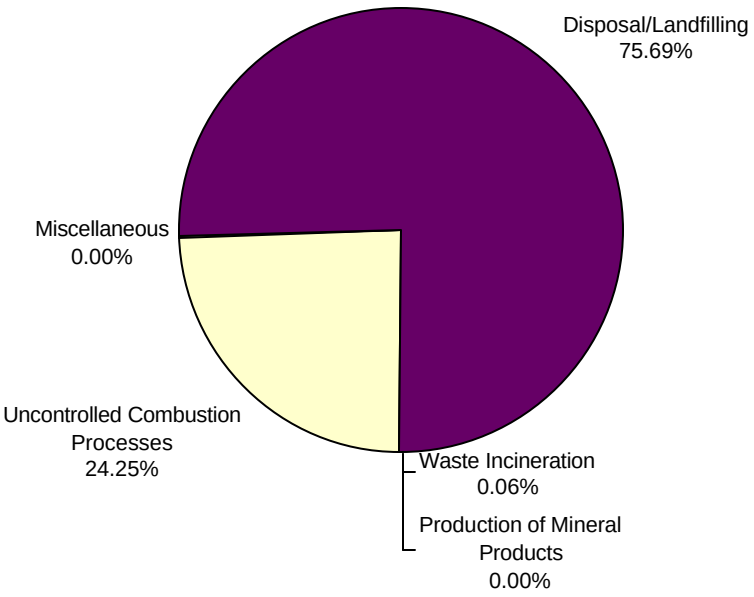


Figure 2-4 Distribution of Releases of Dioxins and Furans in Residues



During site visits, three sites were identified as having the potential for PCB contamination. This was based on observations of leaking transformers and previous disposal practices for transformer oil. A sampling and monitoring program to investigate these sites has been initiated.

2.3.6 Summary of Future Production, Use and Releases of POPs – Requirements for Exemptions

The Convention allows exemptions for various acceptable uses of POPs chemicals. Among these are exemptions that would allow DDT to be used for malaria vector control. While there are no immediate plans to apply for such exemption in respect of DDT, the option remains open under the convention and Jamaica may be prepared to exercise such an option if warranted.

DDT was used for the vector control of the malaria disease. Malaria has effectively been eradicated in Jamaica. Reported cases of malaria in Jamaica over the past ten years (1994 to 2003) (see Table 2-5) have been brought in by persons who are returning to or visiting the island. As such the likelihood is small that there will be any need for vector control for malaria.

Table 2-5 Number of Malaria Cases in Jamaica, 1994 to 2003*

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
3	5	14	4	3	5	7	6	7	9

*Sources: Ministry of Health Jamaica, Annual Report 2000 (for 1994 to 2000) and Personal Communication with Dr. E. Ward, Ministry of Health (for 2001 to 2003).

2.3.7 Existing Programmes for Monitoring of Releases and Environmental and Human Health Impacts of POPs

Currently, there are no programmes to routinely monitor the releases of any of the incidentally formed POPs chemicals.

Although POPs pesticides were previously used in Jamaica there is limited information on the levels of POPs pesticides in the Jamaican environment (water, sediments etc.).

Several scientific studies[7] have investigated and reported on the extent of pesticide contamination in Jamaica. A review of information on pesticide contamination in the Jamaican environment concluded that:

[7] Mansingh, A. and Wilson, A. 1995. Insecticide Contamination of Jamaican Environment III. Baseline Studies on the Status of Insecticidal Pollution of Kingston Harbour. Mar. Poll. Bull. 30: 640-645.

Mansingh, A., Robinson, D.E. and Dalip, K.M. (1997) Insecticide Contamination in the Jamaican Environment. Trends in Analytical Chemistry 16: 115-123.

Witter, J.V., Robinson, D.E., Mansingh, A. and Dalip, K.M. (1998). Insecticide contamination of Jamaican environment. V. Island-wide rapid survey of residues in surface and ground water. Environ. Monitor. & Assess. (In press).

Martin, R., Mansingh, A. and Reid, J. (1999). P-23 Organochlorine Residues In Surface Water And Sediment Of The Yallahs River: 1989-1991; Proceedings Of The Fourth Conference: Faculty Of Pure And Applied Sciences, Mona, January 12-14, 1999 ISBN: 976 41 0126 7. Published By The Faculty Of Pure And Applied Sciences, 1999.

Robinson D. E. and Mansingh A. (1999) Insecticide contamination of Jamaican environment. IV. Transport of residues from coffee plantations in the blue mountains to coastal waters in eastern Jamaica. Environmental Monitoring & Assessment 54(2), 125-141.

Robinson D. E., Mansingh A., and Dasgupta T. P. (1999) Fate and transport of ethoprophos in the Jamaican environment. Science of the Total Environment 238 (Special Issue SI), 373-378.

- Pesticide contamination detected in river and estuarine shrimp is believed to potentially have a significant impact on the reproductive health of fish.
- Kingston Harbour and in particular Hunt's Bay are contaminated with pesticides.
- Little or no studies in Jamaica have been conducted on bioaccumulation of pesticides up the food chain.
- There is a paucity of baseline data on the concentration of nutrients and pesticides in the coastal waters around Jamaica.
- Increased use of fertilizer and pesticides over a twenty (20) year period is expected to result in increasing levels of contamination of the islands coastal waters.

Aldrin, arochlor, DDT, dieldrin, endrin and HCB were among the POPs chemicals found. The earlier of these studies and other initiatives spearheaded by the Pesticides Control Authority, led to the restriction and eventual banning of POPs insecticides in Jamaica in 1999.

2.3.8 Current Level of Information, Awareness and Education About POPs

From observations made during site visits it is evident that the level of awareness of PCB management issues is varied. The level of awareness is high at JPS, bauxite and alumina companies and some of the larger companies. Although the visits did not constitute audits, some inappropriate practices were readily evident. These included the storage of combustible material near in-service and out of service transformers, leaking dielectric fluid, improper storage of PCB wastes and inappropriate dielectric fluid disposal practices in the past. There is a clear need for increasing the awareness of and training on PCB issues at all levels in some companies/institutions ranging from electrical contractors and inspectors to senior management staff.

There are high levels of awareness and commitment to pesticide management issues (including POPs pesticides) in the public sector, commercial users and educational institutions. The lack of awareness and training in pesticide use and the ecological impacts of pesticides among farmers have been noted[8]. There are ongoing efforts to raise the awareness of pesticides and pest management among users and also to train farmers in pest management and pesticide application techniques.

Robinson, D.E., Mansingh, A. (1999). Insecticide Contamination of Jamaican Environment. IV. Transport of the Residues Coffee Plantations in the Blue Mountains to Coastal Waters in Eastern Jamaica, Environmental Monitoring and Assessment, Volume 54, Issue 2, January 1999, Pages 125 – 142.

Mansingh A., Robinson D. E., Henry C., Lawrence V. (2000) Pesticide contamination of Jamaican environment. II. Insecticide residues in the rivers and shrimps of Rio Cobre basin, 1982-1996. Environmental Monitoring & Assessment 63(3), 459-480.

DFID NRSP Project R7668 (Report 5)(2001). Impact and amelioration of sediment and agro-chemical pollution in Caribbean coastal waters. The fate of agro-chemicals in the land water interface, with reference to Jamaica and the wider Caribbean, September 2001.

Robinson, D. E. Henry, C.& Mansingh, A. (2002). Toxicity, Bioaccumulation and Tissue Partitioning of Dieldrin by the Shrimp, Macrobrachium faustinum De Sassure, in Fresh and Brackish Waters of Jamaica.. Environmental Technology, Vol 23, No 11, 2002 p 1275.

[8] Dasgupta, T. and Perue, C. (2003). DFID NRSP Project R7668 (Report 3). Impact and Amelioration of Sediment and Agro-Chemical Pollution in Caribbean Coastal Waters Toxicity Review for Agro-Chemicals in St Lucia and Jamaica.

Robinson D. E. and Mansingh A. (1999) Insecticide contamination of Jamaican environment. IV. Transport of residues from coffee plantations in the blue mountains to coastal waters in eastern Jamaica. Environmental Monitoring & Assessment 54(2), 125-141.

To date there have been very limited efforts to raise the level of awareness about unintentionally formed POPs (dioxins, furans, HCB) among private and public sector stakeholders that own or operate facilities that are sources of unintentionally formed POPs. The level of awareness in the general population about unintentionally formed POPs can be assumed to be very limited since there have been no public education campaigns on the issue.

2.3.9 Relevant Activities of Non-Governmental Stakeholders

The participation of non-government stakeholders to date has been limited. One funding agency has specifically noted the availability of funding for NGOs for POPs related projects.

2.3.10 Overview of Technical Infrastructure for POPs Assessment, Measurement, Analysis, Management, Research and Development – Linkage to International Programmes and Projects

The assessment of POPs issues will require physical resources for sampling and analysis and technically skilled staff to conducts various types of assessments.

Analytical capability for POPs currently is located at the Pesticides Research Laboratory (PRL), at the University of the West Indies' Chemistry Department. At a meeting held in April 2004, the public sector laboratories have indicated the preference to concentrate POPs analytical capabilities at PRL. The laboratory has previously analysed transformer oils for PCBs but no congener analyses were performed. The laboratory has also capability to analyse pesticides including POPs pesticides.

The PRL laboratory currently does not analyse for dioxins and furans although the equipment is available to do such analyses. As part of this project, the analytical capability for speciated PCB and pesticides analyses at low concentrations (i.e., congener analysis) was provided through acquisition of purge and trap attachments for a GC/MS instrument.

There is currently no capability to conduct air sampling for dioxins and furans, PCBs and pesticides. There is need for initiation of a POPs monitoring program that over time should be sustained (for example through graduate research students) based on the need for monitoring. The programme would address PCB levels in groundwater, sewage and sediments and dioxins and furans in air (especially associated with sugar cane field burning,) and also in sewage and sediments.

The presence of incinerators will also require periodic stack testing for dioxins and furans. It is anticipated that the number of such "incinerators" would be reduced. There is currently no local stack testing capability and when required, overseas firms are engaged for this purpose. The demand for stack testing for dioxins and furans may not warrant public sector (i.e., NEPA) investment in acquiring this capability.

Since assessments of POPs related environmental and human health impacts have not been done previously, NEPA staff however, should receive training in order to be able to technically assess such stack monitoring and to audit (witness) tests.

Disposal/Destruction Facilities

There are no hazardous landfill sites nor is there any approved facility for the destruction of PCBs and pesticides.

A major gap is the need for a properly constructed hazardous waste facility

The destruction of PCBs and pesticides is technically possible at cement kilns and the Caribbean Cement Company Ltd. kilns are no exception. Further examination of this option is required. When unwanted pesticides can be readily and safely dissolved in a suitable solvent, the solution can be blended with fuel

oil and burnt in a cement kiln. The quantities of POPs pesticides is small (~31 litres) but the amounts of other non-POPs pesticides is unknown at this time.

Resources for Programme Implementation

The principal and support agencies for POPs management currently have inadequate regulatory and institutional capacity to manage POPs and to enforce regulations. Implementation of the POPs management programme will require additional human resources for monitoring, enforcement, prevention, communication, public education, assessment and reporting functions.

There is a total absence of resources in local government (KSAC, parish councils) to address these functions for the proper management of POPs and other hazardous chemicals. Similarly, a major gap is the lack of human resources at NEPA and PCA needed to carry out these functions as they relate to POPs management.

The Fire Brigade collects data on the number, type and source of fires. They also inspect buildings to ensure that the appropriate fire prevention and fire fighting measures are in place. The Fire Prevention and Public Relations Division have indicated that they need additional personnel and financial resources to conduct sensitisation in schools, communities and organisations about fire prevention and for building inspections.

2.3.11 Identification of Impacted Populations or Environments, Estimated Scale and Magnitude of Threats to Public Health and Environmental Quality

Quantitative exposure data for POPs in Jamaica are lacking. There is no current information on the levels of POPs in the Jamaican environment (especially water, foods or air). Measurements of pesticide levels in 17 major rivers, 7 natural springs and 13 wells across Jamaica in ~1996 found endosulfan in the majority of rivers and springs and sediment samples but aldrin, chlordane, dieldrin, DDE, DDT and lindane were not detected. Measurements of organochlorine (including dieldrin, DDT) and organophosphate pesticides in water, sediment and fauna (shrimp) in the Rio Cobre basin were made in 1982/1983, 1989/1990 and 1995/1996. The 1982–1983 data showed widespread contamination of water, sediment and fauna with chlordane, dieldrin, lindane, endosulfan and DDE. Aldrin and endrin which were used widely in the 1950s and 1960s, were never detected. Chlordane and lindane were not detected in the 1989/1990 samples and DDE and dieldrin levels decreased since 1982–1983. The absence of aldrin and endrin and the decline in chlordane, DDE and dieldrin levels may be attributed to cessation of their use in the area and degradation in soil and water. All of the pesticides however were detected in Kingston Harbour water and sediment (into which the Rio Cobre drains). In view of their persistence and bioaccumulation it is highly likely that pesticides (including POPs) will be present in fauna and flora in Kingston Harbour as well as in other coastal waters and sediments. The extent and levels of contamination are unknown. Significant amounts of the food supply (vegetables, shrimp) are produced in coastal areas and the concentrations of PCBs, POPs and non-POPs pesticides in the food supply and in air are unknown.

Qualitative exposure data for dioxins and furans can be inferred from extent to which the population is exposed to emissions from combustion sources. The burning of sugar cane occurs at the estates associated with seven sugar factories located in St. Thomas (1), St Catherine (2), Clarendon (1), St Elizabeth (1), Westmoreland (1) and Trelawny (1). Other sources of dioxins and furans that would cause exposure are the burning of garbage, fires at waste disposal sites (especially Riverton City site in St Andrew) and hospital incinerators. All of these sources are near population centres and therefore would cause exposure to large segments of the population.

PCBs in 139 soil samples taken at various locations in Jamaica (Blue Mountain and New Kingston, St. Andrew; Rockfort, Hunts Bay and Washington Boulevard, Kingston; and Old Harbour Bay, St.

Catherine) were either not detected or were less than 2 ppm[9]. PCBs were found only in soil samples collected from sites where transformers were stored or in use.

2.3.12 Systems for Assessment and Listing of New Chemicals

The importation of pesticides is regulated by PCA and there is an existing database as well as annual reporting on the quantities of groupings of pesticides and herbicides. New pesticides must be registered prior to their importation and use in Jamaica.

There is no formal system to track other chemicals that are in use in commerce in Jamaica nor is there a system to regulate, evaluate or track any new chemicals that are introduced. For example, the Canadian Domestic Substances List (DSL) tracks all chemicals that are in use in Canada and there is a program to systematically review and assess the chemicals on the DSL.

The Pharmaceutical and Regulatory Affairs Unit (PRAU) in the Ministry of Health regulates the importation of drugs and other chemicals (excluding pesticides). Importers are required to obtain a permit from PRAU. Efforts are under way to computerise the system in a manner that would include retrieval of information on the chemicals imported and their quantities. The database will be limited by the extent to which specific compounds can be identified based on the Harmonised System Classification (HS Code).

In the event that compounds are added to the Convention, if the added compounds are pesticides that are registered for use in Jamaica, then information on the amounts imported would be available through the system that is in place under the Pesticides Act and its regulations. For new POPs that are not pesticides, the information on historical imports would be limited by the level of disaggregation available to the HS Codes and the extent to which historical records have been maintained.

[9] Reid, R.R. and Dasgupta, T.P. (2004). The determination of the levels of polychlorinated biphenyls (PCBs) in some urban and rural areas of Jamaica. Personal Communication with Prof. Dasgupta, Department of Chemistry, University of the West Indies, Kingston, Jamaica.

3. STRATEGY AND ACTION PLAN ELEMENTS

3.1 POLICY

The policy with respect to POPs management reflects the recognition of the risks posed by POPs chemicals and is based on core principles. The policy will rely on integration with and where necessary expansion of existing related environmental policies and Jamaica's sustainable development strategy.

Principles That Underpin the Policy

The strategies and activities for implementing the policy will be guided by the Precautionary Principle, the Polluter Pays and will espouse the "Community Right to Know" principle. When scientific information about potential dangerous environmental or human health effects is incomplete and does not allow the risks to be determined with sufficient certainty, the strategies and activities for POPs management will be guided by the Precautionary Principle. Its application will take place within a risk assessment/risk management/risk communication approach. The Polluter Pays Principle will be applied in decisions regarding the assessment, cleanup and remediation of contaminated sites and will be reinforced as needed in relation to the release of pollutants into the environment and the measure of due diligence taken by the polluter. The release of information to the public will recognise and fully support the "Community Right to Know" principle for all information related to POPs chemicals.

Policy Statement

The policy is designed to eliminate all PCBs and stocks of POPs pesticides from Jamaica and to minimise the exposure of the Jamaican population to incidentally formed POPs (dioxins and furans). Jamaica will continue to fulfil its obligations under the Stockholm Conventions.

Policy Goals

PCBs

The goals of the policy with respect to PCBs are to:

- establish suitable sites for the safe storage of all out-of-service PCB equipment by 2006;
- eliminate all in-service PCB equipment in the transmission system by 2008 and in the distribution system by 2020;
- dispose of all PCB equipment and other PCB materials in storage by 2020;
- identify all PCB contaminated sites by 2006, isolate any such sites and devise means for their decontamination by 2010.

Incidentally Formed POPs

The goals of the policy with respect to incidentally formed POPs are to:

- eliminate the risks to human health posed by the burning of wastes such as hospital wastes and other materials in fireboxes and other quasi incinerators by 2010
- provide environmentally sound and economically sustainable means to minimise or eliminate the risks posed by burning of garbage and sugar cane fields and by the burning of land in preparation for farming by 2010

POPs Pesticides

The goals of the policy with respect to POPs pesticides are to:

- upgrade the management of all sites where pesticides are stored by 2006 by:

  a) upgrading specifications for such sites;

  b) establishing routine inspections of such sites and;

  c) establishing mechanisms for compiling inventories and for reporting changes in the amounts of materials stored at such sites;

- identify all pesticide contaminated sites by 2006, isolate any such sites and devise means for their decontamination by 2010.

- establish means to avoid the importation of unwanted pesticides and other hazardous materials and to establish means to periodically dispose of any such pesticides and other hazardous materials by 2008.

3.2 IMPLEMENTATION STRATEGY

The overall strategy for implementing the policies required for POPs management is to:

a) designate the Natural Resources Committee of Cabinet as the body with overall responsibility for coordinating POPs management activities and for reviewing and assessing progress

b) clearly define all POPs related roles and responsibilities of agencies and institutions

c) ensure that the public and all other stakeholders are made aware of and are adequately trained to undertake their respective roles and functions

Policy Framework

The specific activities needed to implement the policy will be assigned to various government agencies or ministries based on their mandates and portfolio assignments. The coordination of the implementation activities across various government ministries and agencies will be vital and we propose that the Natural Resources Committee of Cabinet have overall responsibility for coordinating the implementation of POPs management policy.

The policy will be supported by a framework in which there are appropriate institutional arrangements, adequate human and physical resources, effective participation by stakeholders and mechanisms for ongoing assessment, evaluation and adaptation to maintain and satisfy obligations under the Stockholm Convention. The key features of the existing situation for each of these aspects and the main gaps or recommendations for each are described below

Institutional Arrangements

The main strategy for implementing the POPs management policy will be to ensure that there is integration with existing policies (Hazardous Substances & Waste Management Policy, Medical Waste Policy, and the National Solid Waste Management Policy)

Since POPs and hazardous materials and wastes can pose threats to human health and natural resources it is fitting that the subject area for the management of POPs and other wastes and hazardous substances fall under the Natural Resource Committee.

- We propose that the Interagency Action Network (IAN) which was set up under the National Solid Waste Management Authority in the Ministry of Local Government, Community

Development and Sport, be reconstituted as a subcommittee of the Natural Resources Committee which is a Cabinet committee. The IAN would coordinate the activities required for the implementation of the hazardous waste and materials, medical waste and solid waste policies.

The management of POPs poses challenges in all media (air, water, land) and hence will require strategies and solutions to address solid and liquid waste problems as well as air pollution related issues. Existing institutional arrangements vest responsibilities for wastes and hazardous substances by media. That is solid waste is under the aegis of the National Solid Waste Management Authority (NSWMA), trade and sewage effluent and air pollution with the National Environment and Planning Agency (NEPA), drinking water and sewage treatment with the National Water Commission (NWC)). These agencies are associated with three separate ministries. In addition, a wide variety of other agencies, ministries and institutions are involved with other aspects of POPs management.

- One of the principal requirements for POPs management will be the improved coordination and close collaboration between and among these various agencies, ministries and institutions.
- The management of POPs also requires integration and coordination with the policies for the management of hazardous materials and hazardous wastes, the medical waste management policy and the national solid waste management policy.
- The management of POPs will be closely integrated with existing and proposed regulatory instruments. Existing instruments will be amended to address POPs-specific issues and, if necessary, new instruments will be developed. The existing and proposed regulations are being harmonised to streamline reporting requirements. Ultimately further integration will strive towards "one-window" reporting of all information related to POPs and other pollutants.
- Mechanisms to facilitate the timely sharing of information among public sector agencies will need to be enhanced or established.

Physical and Human Resources

The existing physical resources for POPs management (storage sites, disposal facilities, sampling and analysis) are limited. There have been active and effective public and private sector initiatives with respect to POPs pesticides management. Although there have been PCB related activities by some of the largest private sector companies, there are major gaps in the human and physical resources to complete the elimination of PCBs form Jamaica.

- The management of POPs will require proper physical resources for the storage of PCB materials, hazardous waste and other hazardous materials, pesticides and pesticide wastes.
- There is urgent need for a designated hazardous waste landfill for the safe disposal of PCB ballasts, hazardous domestic wastes and some hazardous industrial wastes.
- Other physical resources needed are fully compliant incinerators and other facilities for remediation or destruction of POPs and monitoring capability (sampling and analysis) for POPs in the environment.
- Training programs are needed to satisfy the short term human resource requirements for the program. Curricula development is needed to provide educational foundation for satisfying the longer term human resource and public education needs.

  The curricula in tertiary educational institutions should be updated to include local, regional and developing country information on POPs in addition to traditional theoretical and practical topics that cover all aspects of POPs management (including for example, monitoring, treatment technologies, risk assessment etc.). Curricula at the primary and secondary level will be geared towards public education and provide one of the bases for changing behaviours related to waste

management (discontinuation of burning of trash, agricultural land, sugar cane, waste minimization and composting etc.) and safe use of pesticides and other hazardous materials.

Stakeholder Participation

Effective participation by stakeholders will be essential in implementing the policy. Public awareness about POPs is very limited and a major focus of the implementation will be to engage the public through outreach activities and public education programs. A key aspect of the public education program will be to change behaviour of the public especially with respect to unintentionally formed POPs through (burning of garbage and for clearing land). Public education is also necessary to allow informed decisions and responses to releases of POPs from private and public sector sources. Reporting to the general public will be through the proposed pollutant release and transfer registers (PRTR) system which is based on the "Community-right-to-know" principle. Where proprietary process or business information is under consideration, decisions will be guided by the Access to Information Act and community right-to-know.

- The management of POPs will be based on a public education program that:
    - builds awareness of the human health and ecological risks from exposure to POPs,
    - allows the public to recognise and identify potentially dangerous pesticides, PCB ballasts (and other hazardous materials)
    - provides information on alternatives to burning (trash, garbage, clearing land for agriculture)
    - provides information and means to dispose of unwanted pesticides, PCB ballasts and other hazardous materials.
- Outreach activities will ensure that all industrial, commercial and public sector generators of unintentionally produced POPs are made aware of the options to reduce or eliminate their formation and of available assistance to achieve such objectives.

Ongoing Assessment and Evaluation

The plan will include mechanisms for ongoing measurement of achievement of objectives and outputs from each activity, and for the evaluation and assessments of goals. Each activity in the plan has specific indicators that will be used for measurement and will form the basis for assessment and where necessary, modification of activities.

Recommitment to International Obligations (current and future POPs)

Jamaica will continue to participate in all international efforts to reduce or eliminate POPs and to manage the safe use of hazardous chemicals in an environmentally safe manner and where such participation is of benefit and relevance to Jamaica's interests.

3.3 STRATEGIES AND ACTION PLANS

The action plans are designed to meet the Convention's obligations and to achieve the policy goals. The activities are categorised into institutional and regulatory strengthening aspects and other areas that are directly linked to Convention requirements.

3.3.1 Action Plan: Institutional and Regulatory Strengthening Measures

Portfolio responsibilities in government rest with ministries and these responsibilities include the development of policies and regulations. Various cabinet committees have been established to coordinate activities and portfolio areas that span multiple ministries. Table 3-1 lists the lead agencies in various government ministries and agencies together with their area of responsibility.

Table 3-1 Lead Agencies for Implementing the NIP for POPs Management

Lead Agency or Institution (Working Group)	Area of Responsibility relevant to POPs management
PCA	All pesticides related activities. Seek assistance of other institutions from monitoring pesticides in the environment (air, water, sediment, soil, residues on foods etc.) Provide information to support monitoring activities
NEPA	Enforcement of regulations (air quality, trade effluent & industrial sludge, sewage effluent and sewage sludge) and Guidelines
NEPA (PCB Working Group)	Revise PCB Management Guidelines and if necessary PCB regulations
NEPA (Public Education & Outreach Working Group)	Lead and coordinate public education program. Coordinate with National Environmental Education Commission (NEEC), educational institutions, Jamaica Information Service (JIS) and other public information agencies or institutions.
Ongoing POPs environmental monitoring programs	Coordinate all environmental POPs monitoring. Establish formal relationships for information sharing of monitoring data with other agencies and institutions (UWI, JBS, Government Chemist, WRA)
NEPA/MOH (Dioxins & Furans Working Group)	Establish Dioxins & Furans Working Group to address POPs combustion sources (sugar cane, land clearing and poultry wastes, household and medical wastes).
MOH	Rationalise medical waste disposal practices
SIRI	Coordinate agricultural sector initiatives to eliminate or reduce dioxins and furans emissions from the sector

The cabinet committee and the principal ministries and their associated agencies involved in the management of POPs are:

- Natural Resources Committee of Cabinet

Ministry of Land and Environment

  - National Environment and Planning Agency
- Ministry of Health
  - Environmental Health Unit (EHU)
  - Pesticides Control Authority (PCA)
- Ministry of Agriculture

Ministries and agencies that have a supporting and/or an indirect role in POPs management include:

- National Solid Waste Management Authority (NSWMA)
- The Jamaica Fire Brigade
- Government Electrical Inspectorate (Ministry of Commerce, Science and Technology)
- Jamaica Customs
- Ministry of Labour and Social Security
- Factory Inspectorate

The staff within these ministries and agencies have varying levels of expertise in dealing with POPs management issues. In general, the capacity to address regulatory and institutional issues related to dioxins and furans is less adequate than for PCB- and pesticide-related issues. The level of awareness about the formation and health impacts of dioxins and furans is very limited and there is also lack of capacity for health risk assessments. This is evidenced for example by the existence of regulations banning imports of POPs pesticides and the apparent success of such measures and also by the successful removal of PCBs by larger private companies and the ongoing program by the utility company. In contrast, there has been much less progress in addressing the risks posed by combustion sources such as incinerators at hospitals and other facilities, dump sites and burning garbage and in the agriculture sector. To date there has not been any health risk assessment of an industrial facility in Jamaica and very limited use has been made of epidemiological data in relation to air pollution. The action plan to address institutional capacity therefore will focus initially on building awareness among local government agencies and the agricultural sector and strengthening the ability of the health sector to address the issues related to medical waste. In these cases, the key issue will be the development and implementation of sustainable measures to reduce waste and alternatives to burning.

The portfolio responsibilities for these ministries and agencies adequately cover the requirements for establishing policies and regulations relevant to POPs management activities.

The main regulatory and policy instruments that directly address POPs management are as follows:

- Hazardous Waste Policy Framework
- Draft Medical Waste Management Policy
- Draft Hazardous Substances and Hazardous Waste Management Policy
- National Polychlorinated Biphenyls Management Guideline (September 2, 2000)
- Natural Resources Conservation Act and associated regulations and draft regulations
  - Natural Resources (Hazardous Waste) (Control of Trans boundary Movement) Regulations 2002;
  - The Natural Resources (Permit and Licences) Regulations 1996
    - Amended in January 2004 to include 16 new categories

- Draft Air Quality Regulations
- Draft Wastewater and Sludge Regulations
- Draft Pollutant Release and Transfer Register Regulations

- Pesticides Act (1975)
  - Pesticides Regulations (1996)
  - Pesticides (Amended) Regulations (1999)
- Draft Occupational Safety and Health Act, 2004

Many of these activities and regulations require coordination and cooperation among various ministries and agencies. Especially critical are the interfaces related to waste disposal for domestic, medical and industrial wastes, including the elimination of unacceptable practices for burning hospital and commercial wastes, domestic waste, sugar cane fields and burning to clear land for agriculture and to reduce the number of unintentional fires.

Action Plans to address these institutional and regulatory strengthening issues are as follows:

- Strengthen the coordination among government agencies
  - Clarify/elaborate and document (changes in) the Terms of Reference for the Natural Resources Committee of Cabinet to specifically include implementation of the hazardous waste policy and coordination of agencies involved in implementing the policy
  - Combine the Interagency Network and the Committee to Address Management of Toxic Household Chemicals and establish the combined entity as a subcommittee of the Natural Resources Subcommittee of Cabinet
  - Include human health impacts of incidentally formed POPs in particular, and other hazardous wastes in general, as one of the issues to be addressed by the Central Health Committee.
  - Strengthen the role of the Central Health Committee to include assessment of health impacts from POPs (especially dioxins and furans). This should include linkages with epidemiological analysis.
  - Develop guidelines for disposal of household PCB ballasts and unwanted pesticides
  - Develop a public education programme for disposal of PCBs and unwanted or obsolete pesticides
- Develop mechanisms to publicise the activities of the interagency committees
  - Post activities, meetings etc on a designated web site and encourage links to and from other agencies
- NEPA should establish a formal arrangement with the Government Electrical Inspectorate and the Bureau of Standards (JBS) to share information arising from the inspection of or specifications for any PCB containing equipment.

  The inspectorate could be a part of the monitoring process to assist with the identification of PCB equipment that may be in use or in storage and prevention of their use in new or refurbished installations.
- Develop and implement regulatory instruments to manage PCBs as follows:

- Revise/update the National Polychlorinated Biphenyls Management Guideline Document. The document should include specific guidance on the identification, handling, storage and disposal of PCB containing lighting ballasts and paper insulated lead cables (PILC)
- Develop suitable regulatory tools to allow control over importation of transformers and other electrical equipment and transformer and capacitor dielectric fluids to ensure they are PCB free
- Amend the draft Wastewater and Sludge regulations to include:
  - Standards or limits for POPs in ambient waters
  - Limits for PCBs, dioxins, furans and HCB in sewage sludge
  - Requirement for reporting off site transfers of PCBs

- Develop specific legislation dealing with hazardous wastes and hazardous substances (including PCBs specifically and POPs generally and bearing in mind the possibility of additional chemicals that could be added to the POPs list)
  - The legislation should among other things address the intra-island transport of POPs wastes, the storage requirements for POPs waste, reporting requirements, the management and assessment of hazardous waste disposal sites

3.3.2 Production, Import and Export, Use, Stockpiles and Wastes of POPs Pesticides

There is currently no manufacturing of pesticides in Jamaica but some companies reformulate or repackage some pesticides. The importation of POPs pesticides has already been banned. PCA has developed protocols for pesticide importers and retailers and checklists for the inspection of premises that are used by pesticide retailers and importers. These protocols are not included in the Pesticides Act or its regulations. There is also need for a formal (regulatory) requirement for the safe management of the small quantities of POPs pesticides that have been identified.

The quantities of POPs pesticides identified are small and the development of regulations for their storage and disposal may not be cost effective unless such regulations were to address all unwanted or obsolete pesticides. Currently, no designated storage sites or hazardous disposal sites for unwanted/obsolete pesticides exist. These are substantive gaps in the management of pesticides and are discussed under infrastructure. The storage and disposal sites for POPs pesticides could fall under the umbrella of (obsolete) pesticides and other hazardous wastes.

Specific action items are as follows.

- Develop suitable instruments (regulations or guidelines) that prescribe the requirements for characterization, transportation, storage, reporting and disposal of unwanted or obsolete pesticides (and other hazardous materials).

  This could be effected by amending the Pesticide Regulations to require proper storage of pesticides and pesticide wastes and to require reporting of all off-site transfers of pesticide wastes and unwanted/obsolete pesticides

- Strengthen the requirements for storage of pesticides and the role of Pest Control Inspectors

  Although there are check lists for the inspection of premises where pesticides are sold and stored, there are no formal (legislated) specifications for such storage sites. The strengthening would entail developing suitable instruments (guidelines or regulations

with detailed specifications for storage sites, inspections, reporting etc.) and ensuring that inspectors and owners are suitably informed and trained.

3.3.3 Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs

There is no production of PCBs in Jamaica but there are existing regulations governing the export of PCBs (and other hazardous materials). Since there remains the potential (albeit small) for importing dielectric fluid and transformers that contain PCBs, safeguards should be put in place to positively require the import of PCB-free transformers and other electrical equipment and dielectric fluids.

The identification, use, storage and disposal of PCBs and PCB equipment will require additional measures for safe and efficient management of these materials.

- Incorporate in the PCB Guideline document the following:
    - Information and guidance on the identification of PCB containing electrical equipment (transformers, capacitors, PILC, etc.) and protocols for the sampling and testing of such equipment for PCBs
    - Requirements for labelling equipment as PCB free (all transformers manufactured prior to 1979)
    - Require that all transformers manufactured before 1979 be identified, registered, tracked and reported to NEPA.

3.3.4 Action Plan for DDT

Since there are no stockpiles of DDT or DDT wastes, no action plans for this item are required.

3.3.5 Action Plan to Reduce or Eliminate Unintentional Releases of Dioxins, Furans, HCB and PCBs

The release of dioxins and furans from the (intentional) burning of hospital wastes, household garbage and sugar cane fields, poses the most serious and widespread risks to the Jamaican population. To minimise or eliminate the risks posed by dioxins and furans releases from these sources will require addressing the issues more broadly by providing suitable and viable alternative measures to burning and strategies to implement them. The issue can be separated into four distinct areas, namely:

- Management of hospital wastes
- Solid waste management
- Sugar cane harvesting
- Other issues (clearing of agricultural land, unintentional fires)

Sources associated with the first three of these issues were estimated to account for over 98% of the releases of dioxins and furans to air and should receive highest priority – since the other 18 source categories account for less than 2% of the releases.

The disposal of wastes from health care facilities (public and private hospitals, clinics) and veterinary facilities will fall under the Medical Waste Management Policy that is currently being developed. The sources associated with solid waste management are the burning of household waste in backyards but solid waste management will be important in providing solutions that would reduce the amount of household waste that is burned for example by waste minimization and by providing viable alternate waste disposal means (e.g., composting).

Green cane harvesting would obviously eliminate dioxins and furans releases from burning sugar cane for harvesting but its implementation has significant economic, social and technical (farm and factory operations) implications. Careful study of these factors is needed so that viable approaches can be developed and implemented. The clearing of land by burning for agricultural purposes could be eliminated but this would require a public education campaign to raise awareness and demonstrate the benefits of alternatives to such burning.

3.3.6 Identification of Stockpiles and Plan for the Assessment and Mitigation of Releases From Stockpiles

The known amounts of POPs pesticides are small but there are much larger stockpiles of unwanted, unknown and obsolete pesticides. In addition, imported pesticides and other chemicals at customs sometimes are unclaimed. The identification and disposal of these materials present challenges and there are inadequate facilities to safely store these materials. There is some capacity to identify the materials but very limited capacity to safely dispose of them.

It will be essential to assess the suitability of sites and facilities where unwanted, obsolete or unknown pesticides and other unwanted chemicals are currently stored, to develop specifications for safe storage facilities, to upgrade the protocols to inspect such facilities and to implement reporting that will track the status of the sites and account for changes in inventory.

The existing sites at which out of service PCB equipment is stored are unlikely to result in releases to the environment. Sites at which such pieces of PCB equipment were improperly stored were notified so that they could remedy the situation. The mitigation measure will be to transfer the equipment to a secure storage site. The release of PCBs from stockpiles is therefore not expected to be an issue.

In the case of POPs pesticides, release from existing storage sites is not likely.

There is also urgent need for the identification and construction of a designated hazardous waste disposal site.

3.3.7 Action Plan: Identification and Management of Contaminated Sites

During the course of the project for preparing the NIP, potential sites were identified where previous PCB disposal practices could result in contamination. The levels of POPs pesticides in the environment (because of previous use) appear to have been declining but the available information is for limited geographic areas and is not current.

It is also worth noting that there are several contaminated sites in Jamaica. These include sites contaminated with asbestos, lead and wastes from processing bauxite into alumina (red mud ponds). Like POPs, lead and asbestos are persistent and toxic. The cleanup of asbestos and some lead contaminated sites have been handled on a case by case basis. The red mud disposal technology has improved considerably over the years but the contamination of groundwater by red mud ponds remains and the use of ground water in the contaminated aquifers has been severely compromised by seepage from red mud ponds. In spite of these contaminated sites, there are no comprehensive policies, regulations, standards and/or guidelines that address contaminated site assessment procedures, remediation criteria, future site use restrictions or site monitoring measures, or the identification, management or remediation of contaminated sites.

Even if the sites identified prove not to be contaminated with PCBs, the opportunity should be taken to comprehensively address the identification, assessment and management (including cleanup) of all other contaminated sites.

3.3.8 Strategy for Information Exchange

Information exchange within and between agencies involved in POPs management will be vital. It is critical that decision makers in the agencies in question be fully aware of the POPs issues that directly and indirectly affect their agencies.

The primary strategy for information exchange will be to include specific reporting requirements within regulations and Guidelines. The regulations and Guidelines will include detailed specifications for reporting (person responsible for providing the report, schedule, content, recipient etc.). These requirements should work well for information within each regulated community. For cases where the information requirements span different agencies and there are no binding regulatory instruments, the key strategy will be to ensure that agencies or institutions that supply information are made fully aware of the importance of the information and to make arrangements for providing information on a routine basis. The use of memoranda of understanding (MOUs) should be explored especially when there are mutual benefits from sharing the information. The arrangements should be reviewed periodically to ensure they are mutually satisfactory.

3.3.9 Action Plan: Public Education, Outreach and Training

Public Education and Outreach

Target groups to raise public awareness will be identified for each of three POPs management areas (PCBs, POPs pesticides and dioxins & furans). In each of these three areas of POPs management, the goals and objectives of the outreach and public education campaign will be defined and the methods used to achieve them will be matched to the target audiences. The target groups will involve the general public with special attention paid to community groups and associations, environmental non-government organizations, and the primary and secondary education school system. It will be essential that the public awareness and public education program be in step with the solutions (especially alternatives to burning) so that once expectations are raised they can be achieved.

Agencies and groups that would be involved with the delivery of the public education and outreach will be identified. These should include NEPA, PCA, NSWMA, JIS, Jamaica Fire Brigade, private sector companies in the electronic and print media, Ministry of Education, Ministry of Agriculture, Ministry of Health, sugar industry related organizations (SIA, SIRI, PSPF, trade unions etc.), NEEC, etc. We propose that Public Education and Corporate Communication Branch within NEPA and PCA have overall joint responsibility for coordinating the outreach and pubic education campaigns, developing all of the content and for packaging the information to suit various target audiences. The delivery of the packages would be done by various agencies working in close collaboration with NEPA.

In the case of pesticides, the program should make use of previous local and regional public education campaigns such as the "Mine yu 'cide" awareness campaign and the public education programme currently being developed by Jamaica for the Caribbean Chemicals Management Project.

The public education campaign should also ensure that PRTR information on POPs (as well as other pollutants) reaches the general public and that there is sufficient information for comprehension. The latter would be provided by additional public education intervention that provides specific information on POPs.

Training

Training for public and private sector staff engaged in POPs management will be critical. The training requirements are generally specific to the three categories of POPs. The target groups are different for the three classes of POPs (PCBs, POPs pesticides and unintentionally formed POPs) and strategies should be designed accordingly. Initially, training would be carried out with assistance from the international community together with available local expertise.

PCBs

In the case of PCBs, training would focus on ensuring that the (updated) PCB Management Guidelines (or any future PCB regulations) are followed. The target group for this training has been clearly identified (namely those that attended the PCB Workshops and all persons engaged in the maintenance of transformers, capacitors, ballasts and other electrical equipment that could contain PCBs). Once the current Guidelines have been updated, workshops to explain and indicate the requirements should be conducted to ensure that the stakeholders are made fully aware of the requirements. The Guidelines should be distributed to the stakeholders **and** made available on the NEPA web site. Also, additional PCB related information (including regulatory requirements) should be included in the training courses for all persons that would handle electrical equipment. NEPA should be responsible for identifying all such courses and for making arrangements to encourage the institutions to include PCB material in the curricula for such courses.

There is also need for training of additional personnel to undertake sampling and analysis of PCBs.

Pesticides

The additional training for the pesticide user community should build on existing training. The focus should be on training of PCA inspectors, registered importers and pest control operators, agricultural extension officers and farm stores owners. This group of persons will have contact with end users of pesticides (farmers, householders). The training would focus on the safe use and storage of pesticides and provisions (when they are in place) for disposing of unwanted, unknown and obsolete materials.

Dioxins & Furans

Awareness about unintentionally formed POPs appeared to be generally very low even though combustion related activities (burning household garbage and sugar cane fields for harvesting for example) affect large numbers of the population. General public concern and awareness about these combustion related activities currently centre on the health effects of and soiling by particulate matter generated from burning.

Since (understandably) there has been limited public education, training or outreach with respect to POPs the issues will be primarily centred on the development of optimal (efficient and cost effective) strategies to implement them.

In view of the limited participation to date by some stakeholders concerned with incidentally produced POPs, it is essential that there be outreach activities to identify and engage these stakeholders. The list of such stakeholders is as follows:

- Parish Councils
- KSAC
- Community Groups especially in sugar estate areas where cane is burnt for harvesting
- Regional Parks and Markets Officials
- Ministry of Local Government
- Educational institutions
- Libraries

The outreach to these stakeholders should be followed up by specific training that would enable them to fulfil their respective roles in POPs management.

It is vital that NEPA staff be trained sufficiently to undertake witnessing of stack testing, to review and evaluate stack test reports and to assess environmental POPs monitoring data and reports. Training in risk

assessment and risk management techniques both for program design and management of environmental risks are needed.

Education

Various curricula at the secondary and tertiary level currently include limited information on POPs. These curricula should be reviewed and enhanced with a view to providing local and regional information on POPs and POPs issues as well as the traditional theoretical foundations of POPs issues and developed country information on POPs. The curricula for agricultural institutions (College of Agriculture, Science and Education (CASE), Human Employment and Resource Training/ National Training Agency (HEART/NTA)) and other agricultural agencies (RADA, JAS, JBS) should be reviewed to ensure current information on POPs pesticides and pesticide management in general. The theoretical and practical aspects of POPS management for example should include risk assessment and risk management, analytical methods for various POPs, destruction technologies, human health and environmental effects.

The courses for electrical inspectors and other staff that work with or maintain transformers and other electrical equipment that could contain PCBs should be updated/enhanced to include PCB management topics (including health and ecological effects of PCBs).

Curricula at the primary level could be similar in content (at a suitable level) and geared to complement the public education programme.

3.3.10 Action Plan: Monitoring

There is need for an investigative monitoring program to determine the levels of POPs in the Jamaican environment. The objectives of such a program could be follows:

a) establish the levels of POPs and other pesticides in coastal waters, sediments, streams and soil with priority given to food producing (agric ulture, fishing) and recreational areas (marine parks, Kingston Harbour). The monitoring program should be coordinated with the pesticide residue monitoring that is conducted by the Food Storage & Prevention of Infestation Division of the Pesticide Residue and Microtoxins Laboratory.

b) follow up on the preliminary findings of potentially PCB contaminated sites

c) conduct a survey of the levels of dioxins and furans in selected environmental media (sewage sludge, cement kiln dust including dump sites), agricultural soils from sugar cane fields, waste disposal sites subjected to periodic fires, selected sediments (Kingston Harbour), etc. The results of the survey should indicate whether or not additional studies are needed.

d) continue monitoring PCB levels in electrical equipment

e) characterise (stack sampling) dioxin and furan emissions from selected combustion sources

It is recommended that items a) to c) be undertaken as research projects while items d) and e) would be part of the regulatory requirements for POPs management.

3.3.11 Action Plan: Reporting

The principal reporting mechanism will be the PRTR system. The proposed system is based on a) compiling reports submitted by licensees as required by regulations (and Guidelines) and b) NEPA adding information on non-regulated area sources (such as mobile sources, accidental fires) and other sources that individually are too small to be regulated. The PRTR reports and reports required under the Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations would form the basis for international reporting as required under the Convention.

3.3.12 Strategy for Research and Development

No specific research and development activities for developing POPs destruction technologies or for alternate pesticides (to DDT) are proposed. The research activities are limited to environmental monitoring which have been described previously.

3.4 Development and Capacity Building Proposals and Priorities:

Implementation of the NIP will require capacity strengthening in both infrastructure and human resources. The high priority areas for infrastructure and human resource needs are summarised below.

Infrastructure

Laboratory capacity to undertake analyses of dioxins and furans

Capacity (garbage collection equipment) to provide additional garbage collection

Landfill sites

Hazardous waste disposal sites

Secure storage sites for pesticides, PCBs and other hazardous materials

Human Resources

Efforts are under way to add tertiary institution courses to provide graduates who are able to fill positions in the public and private sectors. Current staff in regulatory agencies (NEPA, PCA, NSWMA) will need training to enable them to enforce new regulations and guidelines and to undertake needed assessment studies.

3.5 Timetable for Plan Implementation and Success Indicators

The schedule for the implementing the various action plans, the milestones and performance indicators are summarised in Table 3-2. The performance indicators will allow assessment of progress in achieving targets and to track the effectiveness of various activities.

Table 3-2 Schedule for NIP Implementation and Success Indicators[10]

Description of Action	Lead & Other agencies*	Completion Date	Success Indicators or Milestone	Source Management and Long Term Output Indicators
Institutional, Policy and Regulatory Strengthening Measures				
Revise/Update PCB Management Guideline Document	**NEPA/MLE**	Dec 2005	Revised Guideline Document	Degree of compliance (achievement of targets, timely reporting)
Determine strategy for regulating PCBs (PCB Guidelines alone or include in regulations – see below)	MLE, NEPA	Dec 2005	Decision on strategy	Documented decision
Update Interim Jamaica Drinking water standards to include standards for POPs (and other) pesticides pending the outcome of studies on levels in drinking and ground water.	**MoH/WRA/PCA/ NEPA**	Dec 2006	Results for survey of levels in drinking and ground water Updated regulations	Improved management (if necessary) of regulated pesticides near water supplies
Develop regulations for hazardous chemicals management including storage of unwanted/obsolete pesticides and PCBs (see above)	**MLE**, NEPA, MoH, PCA, stakeholders	Dec 2006	Regulations for hazardous chemicals management	Track amounts and disposal methods and fate (recycled, landfilled, reused etc.)
Develop medical waste plan and finalise policy for management of hospital wastes Implement plan	**MoH**	Dec 2005 Dec 2010	Policy document Reduced medical waste, reduced incineration of medical waste	Lower emissions of dioxins and furans from medical facilities
Develop plan for reduction in trash burning including provision of alternatives in areas not served by garbage collection, public education and awareness programs. Implement plan	**NSWMA, NEPA**, **MLGCDY&S, Parish Councils**	Dec 2006 2007 to 2010	Planning document Amount of garbage collected	Changes in exposure to PM, dioxins & furans from cane field burning Area burnt, changes in PM and dioxins & furans emissions
Update Country Fires Act and develop guidelines for municipal/parish council by-laws regarding trash and slash burning	**Ministry of Agriculture, MLE, MLGCDY&S**	Dec 2006	Updated Act and Guideline Policy for trash burning	Reduction in unauthorised fires, reduced accidental bush and forest fires

[10] The activities, stakeholders, timeline and success indicators are indicative and are the subject of ongoing consultations.

Table 3 2 Schedule for NIP Implementation and Success Indicators (Cont'd)				
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Long Term Output Indicators**
Ensure integration of PCB management with Hazardous Materials and Hazardous Waste Policy	**NEPA/MLE**	Dec 2005	Final Policy Document	Safe transportation and management of hazardous materials and safe storage and management of PCB materials
Establish policy for GCH Implement policy	**SIRI,** SIA, SPF, MOH SIRI, SIA, SPF	Dec 2005 2006 to 2010	Policy (Based on detailed socio-economic study developed by sugar industry groups) Trend to increased GCH	Reduced community complaints, improved respiratory health, reduced exposure to dioxins and furans
Conduct detailed economic analysis of moving towards full introduction of green cane harvesting	SPF, SIRI, SIA, M of Agriculture	Dec 2006	Costs of alternatives	Defined process for implementing policy for GCH
Develop and implement plan for GCH Implement plan	SPF, SIRI, SIA, M of Agriculture	Jun 2006 to Jun 2010 2007 to 2010	Documented plan Reduction in acreage of cane fields burnt	Changes in modes of acreage of sugar cane reaped and other indices of cane farm and sugar factory productivity
Update Draft Wastewater and Sludge Regulations to include standards for PCB in trade effluent, irrigation and sewage sludge	**NEPA/MLE/NWC**	Dec 2005	Gazetted regulations	Comparisons of monitoring data with standards
Disposal of Stockpiles of POPs Pesticides				
Establish secure storage site for POPs pesticides and other unwanted or pesticides	**PCA/MoH** (MLE/NSWMA Coordinate with chemicals management)	Dec 2006	Site established	Annual site status report
Establish a database for stocks of unwanted and unknown pesticides	**PCA**	Dec 2005	Database established	Annual inventory reports of materials in storage sites

Table 3 2 Schedule for NIP Implementation and Success Indicators (Cont'd)				
Destroy stocks of POPs and unwanted or unidentified pesticides	**PCA** Coordinate with chemicals management	Dec 2008	Reduced inventory	Reduced risk of contamination and illicit disposal
Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs				
Test all out-of-service transformers manufactured before 1980 for PCBs	**JPS/NEPA**	Dec 2006	Analytical data	Amounts of PCBs for destruction
Test all in service vault and pad mounted transformers manufactured before 1980 for PCBs	**JPS/NEPA**	Dec 2006	Analytical data	Amounts of PCBs for destruction
Eliminate remaining PCBs in 2.3 kV and 6.9 kV distribution systems	**JPS/NEPA**	Dec 2011	Annual reports showing any newly identified, reductions (amounts shipped or destroyed) and net changes	Shipments, reports to Convention
Establish secure PCB storage site	**JPS** NEPA/MLE /NSWMA/UWI	Dec 2006	Site constructed	Annual site status report Reliable, safe management of PCB materials
Eliminate PCBs in transmission system	**JPS**	Dec 2020	Annual reports showing any newly identified, reductions (amounts shipped or destroyed) and net changes	Compliance with Stockholm Convention, eliminated risks from PCB exposure
Reduce or Eliminate Unintentional Releases of Dioxins, Furans, HCB and PCBs				
Increase in GCH over 5 years	**SIA** SIRI/SPF	Dec 2010	Area of GCH each year	Lower exposure to PM and unintentionally formed POPs
Provide viable alternative disposal means and ban trash burning in urban areas (KMR, Portmore, MBMR, May Pen and Mandeville)	**MLGCD&S/NSWMA** KSAC/Parish Councils, RADA	Dec 2008	Waste disposal and other indicators for alternative disposal Reduction in urban trash burning, Enforceable by-laws	Lower exposure to PM and unintentionally formed POPs

Table 3 2 Schedule for NIP Implementation and Success Indicators (Cont'd)				
Implement alternate disposal methods for hospital and other medical waste	**MoH**	2010	Segregation of hospital wastes into medical and municipal waste, rationalisation of disposal methods for medical waste	Reduced inappropriate burning of hospital waste, lower exposure to dioxins and furans
Plan for Assessment and Mitigation of Releases from Stockpiles and Wastes				
Conduct monitoring program at potentially contaminated sites (based on preliminary investigation)	UWIPRL/NEPA/PCA	2005 to 2008 (if needed)	Monitoring data	Determination of the nature and extent of contamination
Identification and Management of Contaminated Sites				
Risk assessment of contaminated sites (assume there will be 2 sites with likely PCB contamination?)	**UWI PRL**, NEPA, PCA, MoH	Dec 2006	Monitoring data	Assessment of cleanup options
Management of contaminated sites (to be determined pending outcome of monitoring program)	**NEPA, UWI, MLE**			Cleanup of sites. Reduced risks of exposure
Strategy for Information Exchange, Public Awareness, Information and Training				
Develop plans for outreach and public education & training	NEPA, NEEC	Jun 2006	Plan	Track numbers of courses, workshop, participants, web site activity and audiences reached
Outreach program for PCB stakeholders and other interested parties (workshops, site visits by Govt. Electrical Inspectorate, NEPA)	**NEPA/ Government Electrical inspectorate,** MLE,	Dec 2006	Feedback from stakeholders and other interested parties	Numbers of workshop participants, web site activity or audiences reached
Develop strategy for tracking behavioural changes in public including surveys (e.g., annual)	NEPA, NSWMA, STATIN	Jun 2006	Plan	Amounts of solid waste collected, results of behavioural & attitude changes
Launch POPs public education program (focus on incidentally formed POPs and non-POPs pesticides)	**NEPA/PCA** NSWMA, JIS, …	Dec 2005	Outputs from Public Education program	Changes in attitudes and behaviour re POPs generating activities and management of hazardous materials
Training courses for public and private sector staff engaged in POPs management, review and update as needed various curricula in tertiary institutions	NEPA, NEEC & partners	2006 to 2010	Throughput of courses Revised curricula	Capability to enforce municipal/parish council by-laws and offer alternatives to burning
Monitoring				

Table 3 2 Schedule for NIP Implementation and Success Indicators (Cont'd)				
Establish sampling and analytical capability for dioxins & furans	**UWI**	Dec 2005	Instrumentation installed and operators trained, results for ambient and other environmental samples	Capability to locally satisfy monitoring and analytical needs for POPs management
Conduct research monitoring programs (PCBs, pesticides and dioxins & furans in various environmental media (air, freshwater, sediments, soil, foods)	JPS, UWI Pesticide Research Lab, owners of PCB equipment, MOH, PCA	2006 to 2010	Levels in water, soil, sediments known	Potential for exposure in soil, water, sediments and foods
Reporting				
Put in place mechanisms for annual updates. Annual reporting of inventories	**NEPA**	Dec 2005 Dec 2006	Emission inventory protocol document Annual reports	Science based decisions re POPs management
Annual reporting of all PCB tests	**JPS**/NEPA	Jun 2006	Report	Better informed public
Strategy for Research and Development (See monitoring activity)	UWI/NEPA/MLE			

3.6 Resource Requirements

Cost estimates to implement the NIP are provided in Table 3-3. The cost estimates are those beyond those required for existing programs and hence represent only the incremental costs.

Table 3-3 Preliminary Schedule and Cost Estimates for NIP Implementation[11]

Description of Action	Lead & Other agencies*	Completion Date	Success Indicators or Milestone	Source Management and Programmatic Output Indicators	Basis for Cost Estimate	Cost Estimate (US $)
Institutional, Policy and Regulatory Strengthening Measures						
Revise/Update PCB Management Guideline Document	**NEPA/MLE**	Dec 2005	Revised Guideline Document	Degree of compliance (achievement of targets, timely reporting)	0.5 FTE	$20,000
Determine strategy for regulating PCBs (PCB Guidelines alone or include in regulations – see below)	MLE, NEPA	Dec 2006	Decision on strategy	Documented decision	0.5 FTE	$20,000
Update Interim Jamaica Drinking water standards to include standards for POPs (and other) pesticides pending the outcome of studies on levels in drinking and ground water.	**WRA/PCA/MoH/NEPA**	Dec 2006	Results for survey of levels in drinking and ground water Updated regulations	Improved management (if necessary) of regulated pesticides near water supplies	0.2 FTE	$8,000
Develop regulations for hazardous chemicals management including storage of pesticides and PCBs (see above)	**MLE**, NEPA, MoH, PCA, stakeholders	Dec 2006	Regulations for hazardous chemicals management	Track amounts and disposal methods and fate (recycled, landfilled, reused etc.)	0.4 FTE NEPA	$16,000
Develop medical waste plan and finalise policy for management of hospital wastes Implement plan	**MoH**	Dec 2005 Dec 2010	Policy document Reduced medical waste, reduced incineration of medical waste	Lower emissions of dioxins and furans from medical facilities	0.4 FTE	$16,000 $400,000
Develop plan for reduction in trash burning including provision of alternatives in areas not served by garbage collection, public education and awareness programs. Implement plan	**NSWMA, NEPA, MLGCDY&S, Parish Councils**	Dec 2006 2007 to 2010	Planning document Amount of garbage collected	Changes in exposure to PM, dioxins & furans from cane field burning Area burnt, changes in PM and dioxins & furans emissions	0.5 FTE Cost to increase coverage for garbage collection from 75% to 90%	$20,000 $2.04 to $3.05 million/y

[11] The activities, stakeholders, timelines and estimates are indicative and are the subject of ongoing consultations

Table 3 3 Preliminary Schedule and Cost Estimates for NIP Implementation (Cont'd)						
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Programmatic Output Indicators**	**Basis for Cost Estimate**	**Cost Estimate (US $)**
Update Country Fires Act and develop guidelines for municipal/parish council by-laws regarding trash and slash burning	**Ministry of Agriculture, MLE, MLGCDY&S**	Dec 2006	Updated Act and Guideline Policy for trash burning	Reduction in unauthorised fires, reduced accidental bush and forest fires	0.75 to 1.5 FTE	$30,000 to $60,000
Ensure integration of PCB management with Hazardous Materials and Hazardous Waste Policy	**NEPA/MLE**	Dec 2005	Final Policy Document	Safe transportation and management of hazardous materials and safe storage and management of PCB materials	0.5 FTE	$20,000
Establish policy for GCH Implement policy	**SIRI,** SIA, SPF, MOH SIA, SIRI, SPF	Dec 2006 2006 to 2010	Policy (Based on detailed socio-economic study developed by sugar industry groups) Trend towards increased GCH	 Reduced community complaints, improved respiratory health, reduced exposure to dioxins and furans	0.5 to 1.5 FTE To be determined	$20,000 to $60,000 To be determined
Conduct detailed economic analysis of moving towards full introduction of green cane harvesting	**SIRI, SIA** SPF, , M of Agriculture	Dec 2006	Costs of alternatives	Defined process towards increased GCH	1 FTE	$40,000
Develop and implement plan for GCH Implement plan	**SIRI, SIA,** SPF, M of Agriculture	Jun 2006 2007 to 2010	Documented plan Reduction in acreage of cane fields burnt	Changes in modes of acreage of sugar cane reaped and other indices of cane farm and sugar factory productivity		To be determined

Table 3 3 Preliminary Schedule and Cost Estimates for NIP Implementation (Cont'd)						
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Programmatic Output Indicators**	**Basis for Cost Estimate**	**Cost Estimate (US $)**
Update Draft Wastewater and Sludge Regulations to include standards for PCBs in irrigation water and sewage sludge	**NEPA/MLE/NWC**	Dec 2005	Gazetted regulations	Comparisons of monitoring data with standards	0.1 FTE	$4,000
Disposal of Stockpiles of POPs Pesticides						
Establish secure storage site for POPs pesticides and other unwanted pesticides	**PCA/MoH** (MLE/NSWMA Coordinate with chemicals management)	Dec 2006	Site established	Annual site status report	1 site established	$100,000
Establish a database for stocks of unwanted and unknown pesticides	**PCA**	Dec 20065	Database established	Annual inventory reports of materials in storage sites	0.25 FTE	$10,000
Destroy stocks of POPs and unwanted or unidentified pesticides	**PCA** Coordinate with chemicals management	Dec 2008	Reduced inventory	Reduced risk of contamination and illicit disposal	To be determined	To be determined
Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs						
Test all out-of-service transformers manufactured before 1980 for PCBs	**JPS/NEPA**	Dec 2006	Analytical data	Amounts of PCBs for destruction	500 screening tests 100 GC tests	$5,000 $25,000
Test all in service vault and pad mounted transformers manufactured before 1980 for PCBs	**JPS/NEPA**	Dec 2006	Analytical data	Amounts of PCBs for destruction	1,000 screening tests 200 GC tests	$10,000 $50,000
Eliminate remaining PCBs in 2.3 kV and 6.9 kV distribution systems	**JPS**	Dec 2011	Annual reports showing any newly identified, reductions (amounts shipped or destroyed) and net changes	Shipments, reports to Convention	To be determined	To be determined
Establish secure PCB storage sites	**JPS** NEPA/MLE /NSWMA	Dec 2006	Site constructed	Annual site status report. Reliable, safe management of PCB materials	2 sites (1 JPS, 1 Public Sector)	$500,000

Table 3 3 Preliminary Schedule and Cost Estimates for NIP Implementation (Cont'd)						
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Programmatic Output Indicators**	**Basis for Cost Estimate**	**Cost Estimate (US $)**
Eliminate PCBs in transmission system	**JPS**	Dec 2020	Annual reports showing any newly identified, reductions (amounts shipped or destroyed) and net changes	Compliance with Stockholm Convention, eliminated risks from PCB exposure	2 FTE	$4,000
Reduce or Eliminate Unintentional Releases of Dioxins, Furans, HCB and PCBs						
Increase GCH over 5 years	**SIA** SIRI/SPF	Dec 2010	Area of GCH each year		Preliminary – to be revised during implementation to Include social cost	$80,000 to $200,000
Provide viable alternative disposal means and ban trash burning in urban areas (KMR, Portmore, MBMR, May Pen and Mandeville)	**MLGCD&S /NSWMA** KSAC/Parish Councils , RADA	Dec 2008	Waste disposal and other indicators for alternative disposal Reduction in urban trash burning, Enforceable by-laws		Preliminary – to be revised during implementation to Include social cost	$90,000 to $500,000
Implement alternate disposal methods for hospital and other medical waste	**Ministry of Health**	2010	Characterisation of medical waste Segregation of hospital wastes into medical and municipal waste, rationalisation of disposal methods for medical waste	Reduction in amounts of all types of waste from medical facilities Reduced inappropriate burning of hospital waste, lower exposure to dioxins and furans	To be determined	To be determined
Plan for Assessment and Mitigation of Releases from Stockpiles and Wastes						
Conduct monitoring program at potentially contaminated sites (based on preliminary investigation)	UWIPRL/NEPA/PCA	2005 to 2008 (if needed)	Monitoring data	Determination of the nature and extent of contamination	2 graduate students over 5 years	$100,000
Identification and Management of Contaminated Sites						

Table 3 3 Preliminary Schedule and Cost Estimates for NIP Implementation (Cont'd)						
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Programmatic Output Indicators**	**Basis for Cost Estimate**	**Cost Estimate (US $)**
Risk assessment of contaminated sites (assume there will be 2 sites with PCB contamination?)	**UWI PRL**, NEPA, PCA, MoH	Dec 2006	Monitoring data	Risk assessment of extent of contamination and determination of cleanup method	Human health risk assessment for two sites	$60,000
Management of (two?) contaminated sites	**NEPA, MoH, MLE**	207 - 2010		Cleanup of sites. Reduced risks of exposure	To be determined	To be determined
Strategy for Information Exchange, Public Awareness, Information and Training						
Outreach program for PCB stakeholders and other interested parties (workshops, site visits by NEPA)	**NEPA,** MLE, Government Electrical inspectorate	June 2005	Feedback from stakeholders and other interested parties	Numbers of workshop participants, web site activity or audiences reached	0.5 FTE for 2 years	$40,000
Develop plans for outreach and public education & training	NEPA, NEEC	June 2006	Plan	Track numbers of courses, workshop, participants, web site activity and audiences reached	0.5 FTE	$20,000
Develop strategy for tracking behavioural changes in public including surveys (e.g., annual)	NEPA, NSWMA, STATIN	June 2006	Plan	Amounts of solid waste collected, results of behavioural & attitude changes	0.5 FTE	$20,000
Launch POPs public education program (focus on incidentally formed POPs and non-POPs pesticides)	**NEPA** NSWMA, JIS, …	Dec 2005	Outputs from Public Education program	Changes in attitudes and behaviour re POPs generating activities and management of hazardous materials	Preliminary estimate only - to be revised/refined	$40,000
Training courses for public and private sector staff engaged in POPs management, review and update as needed various curricula in tertiary institutions	NEPA, NEEC & partners	2006 to 2010	Throughput from training courses Updated curricula	Capability to enforce municipal/parish council by-laws and offer alternatives to burning	PCB courses (2/year, 2 days/course) Dioxins & furans courses (4/year, 2 days/course)	35,000
Monitoring						

Table 3 3 Preliminary Schedule and Cost Estimates for NIP Implementation (Cont'd)						
Description of Action	**Lead & Other agencies***	**Completion Date**	**Success Indicators or Milestone**	**Source Management and Programmatic Output Indicators**	**Basis for Cost Estimate**	**Cost Estimate (US $)**
Establish sampling and analytical capability for dioxins & furans	**UWI**	Dec 2006	Instrumentation installed and operators trained, results for ambient and other environmental samples	Capability to locally satisfy monitoring and analytical needs for POPs management	Sampling equipment Analytical over 5 years Staff (graduate student support) over 5 years)	$30,000 $50,000 $50,000
Conduct research monitoring programs (PCBs, pesticides and dioxins & furans in various environmental media (air, freshwater, sediments, soil, foods)	JPS, UWI Pesticide Research Lab, owners of PCB equipment, MOH, PCA	2006 to 2010	Levels in water, soil, sediments known	Potential for exposure in soil, water, sediments and foods		$120,000
Reporting						
Put in place mechanisms for annual updates and annual reporting of inventories	**NEPA**	Dec 2005 Jun 2006	Emission inventory protocol document Annual reports	Science based decisions re POPs management	1 FTE staff for 1 year	$40,000
Annual reporting of all PCB tests	**JPS**/NEPA	Jun 2006	Report	Better informed public	0.2 FTE /year	$8,000

4. APPENDIX 1

4.1 Government and Key Stakeholder Endorsement

Written comments on the NIP and several intermediate reports were solicited and received from stakeholders throughout its development. The review and endorsement of the NIP was undertaken by stakeholder meetings in March 2005. A further review was undertaken by two Working Groups (a third was deemed unnecessary) in April 2005.

4.2 Record of Public Consultation Meetings and Workshops

December 3, 2003	Stakeholders' Meeting, Terra Nova All Suite Hotel
February 16, 2004	PCB Stakeholders' Workshop
February 18, 2004	Pesticides Stakeholders' Workshop
February 19, 2004	Dioxins and Furans Stakeholders' Workshop
November 22 & 23, 2004	PCB Training Workshop
March 1, 2005	Pesticides stakeholders
March 2, 2005	Dioxins and Furans stakeholders
March 3, 2005	PCB stakeholders
April 12, 2005	PCB Working Group Meetings
April 13, 2005	Dioxins & Furans Working Group Meetings
May 18 and 19, 2005	Workshop on Emission Inventories (EIs) and Pollutant Release and Transfer Registers (PRTRs)
June 14, 2005	PRTR calculation workshop
June 17, 2005	Sugar stakeholders meeting
June 20, 2005	Dioxins & Furans Sensitization workshop

4.3 Jamaica's History in Addressing the POPs Issue

- Over 800 kg of the known stocks of the POPs pesticides as well as other unwanted or obsolete were collected and shipped for destruction in 1998.
- Some of the stocks of PCBs have been collected by bauxite and alumina companies and the Jamaica Public Service Company and either destroyed locally or shipped overseas for destruction.
- POPs Pesticides are among the pesticides whose importation into Jamaica are banned under the Pesticide Control Act Regulations.